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Railroad Locomotive Safety Standards and Locomotive Inspection

DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration

49 CFR Part 229 and 230

[Docket No. LI-6, Notice No. 3]

Railroad Locomotive Safety Standards and Locomotive Inspection

AGENCY: Federal Railroad Administration (FRA), Department of Transportation (DOT).

ACTION: Final rule.

SUMMARY: This document revises Part 230 (49 CFR Part 230) and establishes a new Part 229 (49 CFR Part 229). The parts contain FRA's rules applicable to railroad locomotive inspection. The revised rules update, consolidate, and clarify the old rule and eliminate certain rules no longer considered necessary for safety. This action is taken by FRA to improve its safety regulatory program.

EFFECTIVE DATE: These rules will become effective on May 1, 1980.

FOR FURTHER INFORMATION CONTACT: Principal Authors. Principal Program Person: Arthur T. Ireland, Office of Standards and Procedures, Federal Railroad Administration, Washington, D.C. 20590. Telephone 202–426–9186. Principal Attorney: Michael E. Chase, Office of the Chief Counsel, Federal Railroad Administration, Washington, D.C. 20590. Telephone 202–426–8836.

SUPPLEMENTAL INFORMATION:

Background

Regulatory reform.—On March 23, 1978, the President issued Executive Order 12044. In that Order, he directed all Executive Agencies to adopt procedures to improve existing and future regulations. As a matter of policy, the Order requires that regulations be as simple and clear as possible, achieve legislative goals effectively and efficiently, and not impose unnecessary burdens. To achieve this policy objective, the Order requires Agencies to address the following considerations, among others, when developing regulations: (1) The need for and purpose of the regulation must be clearly established; (2) An opportunity must be provided for early participation and comment by other Federal Agencies, State and local governments, businesses, organizations, and individual members of the public; (3) Meaningful alternatives must be considered and analyzed before the regulation is issued; and (4) Compliance costs, paperwork, and other burdens on the public must be minimized.

In response to the policies set forth in Executive Order 12044, FRA initiated a General Safety Inquiry for the purpose of evaluating and improving its safety regulatory program. This inquiry was announced in the May 8, 1978, issue of the **Federal Register** (43 FR 19696). That notice also announced that FRA would conduct a series of two-day public hearings. The notice stated that the purpose of the hearings would be to obtain information from the public that would help FRA to determine whether many of its existing regulations should be expanded in scope, revised, or revoked.

FRA has conducted all of the hearings announced in the notice. These hearings dealt with the following subjects: (1) locomotives (June 14 and 15, 1978); (2) freight cars and safety appliances (July 12 and 13, 1978); (3) power brakes (September 13 and 14, 1978); (4) track and related structures, appliances, and devices (November 15 and 16, 1978); and (5) signal and communications systems (February 21 and 22, 1979).

After reviewing the testimony presented at those hearings, and the written comments submitted in response to the hearing notice, FRA has begun the process of issuing proposed rules for the purpose of improving many of its existing rules and eliminating others no longer considered necessary for safety. To date, three notices of proposed rulemaking (NPRM) have been issued. These are as follows: (1) Freight Car Safety Standards (44 FR 1419; January 5, 1979); (2) Locomotive Inspection (44 FR 29604; May 21, 1979); and (3) Track Safety Standards (44 FR 52104; September 6, 1979). The Freight Car Safety Standards were revised and the final rule published on December 31, 1979 (44 FR 77328).

As announced in the NPRM, the FRA held a two-day public hearing on the proposed revision to the locomotive inspection regulations. The hearing, originally scheduled to begin on July 10, 1979, was postponed until September 12, 1979, at the request of the Association of American Railroads (44 FR 38609; July 2, 1979). At that hearing, testimony was presented by eight railroads, one state regional transportation agency, the Association of American Railroads (AAR), the Railway Labor Executives Association (RLEA), and one manufacturer of railroad locomotives. In addition, written comments were submitted by a number of railroads, including some which did not testify at the hearing, rail labor groups, state transportation agencies, a Federal agency, locomotive manufacturers, and private persons. All of the testimony and comments have been reviewed and fully considered during the formulation of the final rules set forth in this document.

Most commenters expressed strong support in general for the proposed rules. However, many recommended that revisions be made to one or more of the changes proposed by FRA. Most of the suggestions were minor or technical in nature, although certain proposed changes sparked sharp disagreement from one or more commenters. These latter changes included the extention from a 30-day inspection to a 92-day inspection, the consecutively numbered periodic inspection system, the movement of locomotives for repair, and the requirements for wheel slip/slide protection. Only one commenter, RLEA, concluded that on balance the benefits of the proposed revision were outweighed by what it believed to be the possible adverse effects. However, many of RLEA's comments were focused on entirely new safety requirements that it believed should have been included the proposed rules rather than on the changes actually included the proposed rules.

The following is a summary of many of the comments received and an explanation of the revisions made by FRA in response to those comments. The comments and related revisions have been organized in a section by section format. Minor editorial or language changes have been made to a few sections without a specific explanation.

Section by Section Analysis

PART 230—STEAM LOCOMOTIVE INSPECTION

§ 230.0 Steam power locomotives.

No specific comments were received and no change has been made. Hence, Subpart A and Subpart B of 49 CFR Part 230 will be removed from the Code of Federal Regulations (CFR). The regulations remain in effect even though their complete text will no longer be reprinted in future additions of the CFR.

PART 229—RAILROAD LOCOMOTIVE SAFETY STANDARDS

Subpart A—General

§ 229.3 Scope.

No comments were received and no change has been made.

§ 229.3 Applicability.

The AAR suggested that the part not apply to locomotives operated occasionally in the United States that are owned by railroads in Canada and that comply with Candian Transport

Commission regulations. The part, however, applies to carriers rather than to locomotives. Accordingly, each carrier is responsible for all locomotives on its line regardless of origin or ownership. Even if there were authority under the Locomotive Inspection Act to exempt as a group all Canadian locomotives, which is doubtful, the FRA does not believe that a blanket exemption is needed or warranted. Hence, no change has been made.

§ 229.5 Definitions.

One commenter, RLEA, opposed the change in the meaning of the term "locomotive". Under the NPRM, the term "locomotive" would always be singular. Where more than one piece of equipment is involved, the plural "locomotives" would be used or a phrase that indicates the plural, e.g., "locomotive consist". RLEA preferred the term "unit" to refer to a single locomotive and the term "locomotive" to refer to a locomotive consist. FRA has chosen to adopt the definition of a locomotive as a single piece of equipment. The use of "locomotive" to refer to the consist is inherently ambiguous since a consist may be comprised of only one locomtive. Clarity of the regulations warrants the change in terminology.

The RLEA also opposed the change in terminology from "enginemen" to "engine crew" found throughout the proposed rule. The term "enginemen" has been used in various collective bargaining agreements and the RLEA is worried about possible confusion. FRA is not convinced that the change to a sex neutral term will be disruptive. It is the policy of the President and of DOT to eliminate gender related terms. Thus, the final rule uses the term "engine crew".

The AAR and several railroads suggested that the definition of a locomotive specifically exclude specialized work equipment that have propelling motors, such as pile drivers and cranes. There is not any such exclusion either in the NPRM or the current regulations. FRA recognizes that specialized work equipment does not properly fit under the same regulatory scheme as equipment used to haul a train or to carry passengers and equipment, even though that equipment is technically encompassed within the scope of the Locomotive Inspection Act. Hence, FRA has revised the definition of "locomotive" to exclude specialized work equipment from the requirements of the part. FRA will continue to implement the basic statutory safety requirements with respect to such work equipment by using the Special Notice for Repair when appropriate.

The AAR and several railroads also suggested the addition of two new definitions. It was suggested that the word "crack" be defined in the same manner as it had been in the Freight Car Safety Standards. FRA agrees with this comment. The final rule includes definitions for both "crack" and "break". These definitions are the same as in the Freight Car Safety Standards. It was also suggested by AAR that "high voltage" be defined as an electrical potential of more than 220 volts. FRA agrees that this term should be defined for the sake of clarity. The final rule incorporates the value of 150 volts taken from the previous regulations in §§ 230.244, 230.246, 230.439, 230.440, and 230.441. FRA believes that the incidence of electrical fires and electrically related injuries warrants retaining the 150 volt level.

FRA has added several new definitions not already discussed to the final rule. First, the FRA has defined "dead locomotive" and "lite locomotive". These two terms are used in connection with § 229.9 of the final rule, "movement of non-complying locomotives." Second, the definition of "powered axle" is included in § 229.5 of the final rule rather than in § 229.115 as proposed in the NPRM. Third, "serious injury" is defined so that the accident reporting requirements of § 229.17 can be uniformly implemented.

§ 229.7 Prohibited acts.

This section is the same as in the NPRM. Only one commenter, RLEA, addressed this section. RLEA believed that the provision imposes strict liability. The provision is essentially a restatement of Section 2 of the Locomotive Inspection Act (Act). For purposes of civil penalty liability, any use of a locomotive that is not in proper condition and safe to operate or that has not been inspected or tested as required is a violation. The RLEA also stated that the minimum penalty for any violation should be higher than $250. The penalty range provided in the final rule is a restatement of the statutory penalty range. The penalty imposed by FRA is subject to the discretion of the Administrator, though it may not be less than $250 nor more than $2500. The final rule includes an appendix that sets forth a penalty schedule for various violations of the part.

§ 229.9 Movement of non-complying locomotives.

This section, entitled "movement for repair" in the NPRM, was strongly attacked by AAR and virtually every railroad commenter. Two major concerns were expressed concerning the requirement in proposed paragraph (b) that a non-complying locomotive may move only to the nearest point or the nearest forward point where repairs can be made.

First, they argued that this movement limitation when read in conjunction with § 229.101 "engines" and § 229.115 "slip/slide alarms" as proposed in the NPRM would be extremely costly, disruptive of rail operations, and a possible safety hazard. These conclusions were reached because the NPRM would have made the absence on a locomotive in road service of wheel slip/slide protection for any reason a non-complying condition. Thus, any of a host of possible enroute problems (traction motor problems, transition problems, internal combustion engine problems, grounds, shorts, and may other problems) could render a locomotive in non-compliance because the problem results in the loss of wheel slip/slide protection. The railroad commenters said that the necessity to stop trains in order to remove locomotives from the consist solely because of the absence of enroute wheel slip/slide protection is overly restrictive.

FRA agrees that §§ 229.9, 229.101, and 229.115 as proposed would have created substantial compliance problems. As a result, FRA has modified the requirements in §§ 229.101 and 229.115 relating to wheel slip/slide requirements.

Second, rail industry commenters argued that the requirement that a non-complying locomotive may be moved only to the nearest repair point or to the nearest forward repair point is unduly restrictive even for problems that do not arise enroute. They argued that balancing the workload, especially heavy repairs, among different repair points is critical. This balancing may require a locomotive to move from a point or past a point where repairs could be made. A rule which eliminated the ability to balance the workload would increase costs and reduce locomotive availability. These commenters were sharply critical of the FRA for proposing a rule limiting the movement of locomotive for repair without accident data that indicates a specific safety problem.

FRA agrees that the NPRM proposed a stricter rule in one respect than the prior policy. Under the previous "jumpers down" policy a non-complying locomotive with its jumpers down was not restricted in its movement to the nearest repair point or nearest forward repair point. The impact of the proposed change on repair workloads was not adequately assessed by FRA and the

safety implications of moving non-complying locomotives do not warrant a rule as restrictive as proposed. The final rule allows a railroad to move a non-complying locomotive as a lite or as dead locomotive to a more distant repair point of its choice.

The final rule is, however, quite similar to the NPRM in several respects. First, it provides that a locomotive with a non-complying condition may be moved only after inspection and tagging. The tag shall specify the maximum speed and other restrictions necessary for safety conducting the movement.

In general, the tagging requirement follows the language of the recently revised Freight Car Safety Standards. Thus, the final rule provides that the engineer in charge of the movement of the non-complying locomotive shall be notified in writing of the presence of the locomotive and the maximum speed and other restrictions affecting its movement. The final rule also provides that a qualified person shall make the determinations regarding the safety of the movement. RLEA had objected to the absence of such a provision in the NPRM on the basis that only a qualified person can assure that the movement is safe. FRA agrees.

Second, paragraph (e) of the final rule is the same as paragraph (c) of the NPRM. A locomotive remains a locomotive even if its propelling motor is inoperative and the control jumper cables are not connected. Thus, "jumpers down" policy is ended. However, several commenters endorsed the "jumpers down" policy over the NPRM's proposed requirement because the policy provided a mechanism for dealing with numerous unusual situations. EMD questioned how a locomotive designed for service abroad could be moved to a port for shipment when the locomotive is not designed for compliance with FRA requirements. One railroad commenter expressed a similar concern about locomotives being moved for rebuilding or scrapping.

FRA agrees that the rule as proposed created serious problems as typified by the above examples. Since repair is not intended for locomotives being moved for scrapping or for export, the NPRM's limitation on the movement of non-complying locomotives to certain repair points is not acceptable. However, under the final rule a non-complying locomotive may be moved to any point so long as it is properly inspected and tagged. In short, the tag has replaced the "jumpers down" as the lawful method for moving non-complying locomotives.

FRA has adopted an inspection and tagging provision for a number of reasons. First, it provides a mechanism to insure that non-complying locomotives receive an inspection before thay are moved. Second, the requirement for appropriate speed and safety restrictions insures that movement can be made in a safe manner. Third, it eliminates an artificial scheme whereby mere removal of the control jumper cables results in the pretense that a locomotive has turned into something else. Fourth, it provides an opportunity to put into a consist or leave in the consist a locomotive with a non-complying condition that can be safely moved in that manner. This will permit continued wheel slip/slide protection in some instances that would otherwise not be provided. It will also eliminate the necessity of rearranging the consist to accommodate the "jumpers down" policy. FRA notes that the AAR did not oppose a requirement that a non-complying locomotive be inspected before movement and display a tag containing the information required by paragraph (a).

One advantage inherent to the NPRM's movement provision, discussed in the preamble of the NPRM, is that it would have eliminated the power penalty resulting from the jumpers down policy. The elimination of the power penalty could be done in a manner consistent with the language of the Act only by limiting the movement of the non-complying locomotive to the nearest point or the nearest forward point where repairs could be made. Several commenters suggested that the increased power utilization from the proposed change was of little consequence and that the flexibility to move a non-complying locomotive to a destination of the railroad's choice more than outweighed the power penalty. Thus, paragraph (a) of the final rule perserves the power penalty approach by providing that a non-complying locomotive may only be moved as a lite locomotive or a dead locomotive.

There are two important exceptions to the requirements in paragraph (a). The first exception is for locomotives that develop enroute defects. Paragraph (b) provides that a locomotive that is properly inspected and tagged in accordance with paragraph (a) may continue to use its propelling motors until the next calendar day inspection or until the nearest forward repair point, whichever event occurs first. This limited exception is necessary to permit trains to avoid immediately stopping enroute to comply with the requirements of paragraph (a). Stopping a train on a main line can present safety problems. Moreover, the possibility of stopping numerous trains at remote locations because of the power penalty could also cause serious operational problems and delays.

The second exception deals with movements within a yard. Paragraph (c) provides that if certain conditions are met, a non-complying locomotive may be moved within a yard without meeting the requirements of paragraph (a). These conditions are that the locomotive may only be moved dead or lite, solely for the purpose of repair, and at a speed that does not exceed 10 miles per hour. This exception is warranted to facilitate the safe movement of locomotives within yards to a repair shop. The burden of tagging is not justified where the movement is so limited and appropriate safety restrictions are mandated.

The final rule also includes two additional restrictions. First, paragraph (d) provides that a dead locomotive may not continue in use as a controlling or lead locomotive following a calendar day inspection. This has been added to insure that crew members are not permitted or required to occupy the cab of a non-complying locomotive over an extended period of time. Of course, any use of a non-complying locomotive as a lead or controlling locomotive prior to a calendar day inspection may be made only if it is safe to do so. Second, the final rule clarifies that the use of a non-complying locomotive in accordance with § 229.9 is still subject to a Special Notice for Repair. Under § 229.9, the carrier is responsible to determine the safety of a movement. However, if an FRA inspector determines that the speed and other safety restrictions are inadequate in a given instance, the inspector may issue a Special Notice mandating appropriate safety restrictions. In that event, any use of the non-complying locomotive shall be made in accordance with the restrictions contained in the Special Notice.

Finally, it should be noted that nothing in § 229.9 requires that jumper cables be up or down. This is the carrier's decision. Similarly, nothing in § 229.9 requires that a locomotive in compliance with the part display a tag. Thus, a complying locomotive may be moved dead in train or dead in consist without a tag. What § 229.9 does is quite simple. It provides that every use of a locomotive is subject to the part. Since the locomotive is subject to the part, it must be in compliance with the requirements. The tag is a means of enabling a locomotive to safely remain in use until the conditions indicated on the tag are repaired or otherwise corrected.

§ 229.11 Locomotive identification.

No comments were received. No change has been made.

§ 229.13 Control of locomotives.

RLEA commented that remote locomotives should be under control by the engineer. FRA agrees that the language "coupled in multiple control" is ambiguous with respect to remote locomotives, although FRA believes that remote locomotives are covered by that language. The final rule specifically provides that remote locomotives shall be under control from the cab of the controlling locomotive.

Two railroad commenters, Burlington Northern (BN) and Southern Pacific Transportation Company (SP), expressed concern about the application of the control requirement to auxiliary brake systems. In particular, they were concerned that the rule would require the dynamic brake to be in use on each axle of every locomotive in the consist if an auxiliary brake system were employed. If this were the case, it could result in a conflict with carrier rules that limit the number of axles that may have a dynamic brake in use. FRA agrees that the carrier should be able to set the maximum number of axles that have a dynamic brake in use. The proposed rule was not intended to preclude this. However, to clarify this point the final rule provides that only the portion of the auxiliary brake system actually in use must respond to control from the cab of the controlling locomotive.

§ 229.14 Non-MU control cab locomotives.

This provision is new. At the hearing, the Chicago and North Western Transportation Company (CNW) opposed including non-MU control cab locomotives under the full requirements of the part. CNW noted that except for certain components necessary for control purposes, these control cab locomotives are essentially passenger coaches. It was argued that only the control stand and other equipment related to controlling the train should be subject to the part, as is the practice under the current rule. FRA agrees. Section 229.14 provides that only those components added to the passenger car to enable it to serve as a lead locomotive, to control the locomotive actually providing power, and to otherwise control the train are subject to the part.

§ 229.15 Final report.

The final rule reflects a clarifying change in terminology. The word "use" has been substituted for "service". This change in terminology has also been made elsewhere in the final rule where the word "service" was used to mean any and every type of service. Types of service are component parts of the "use" of a locomotive. Thus, the final report is to be filed when the locomotive is retired from "use".

§ 229.17 Accident reports.

The final rule reflects two changes from the proposed rule. First, the requirement to preserve the parts affected by an accident in every instance until after inspection by the FRA is made clear. The additional language in the proposed rule regarding the inability of the locomotive to move under its own power and interference to traffic is confusing and unnecessary. It has been deleted. Second, a sentence has been added to clarify that the statutorily mandated reporting requirements detailed in § 229.17 are in addition to the reporting requirements of 49 CFR Part 225.

§ 229.19 Prior waivers.

This is a new section. Numerous waivers of various types have been granted by the FRA and the ICC over many decades. This section is designed to clarify the consequences of the revision of the locomotive inspection regulations on these prior waivers. It provides that all waivers of every form and type from any requirement of any order or regulation implementing the Locomotive Inspection Act applicable to locomotives under Subparts C and D of current Part 230 (redesignated Part 229 in this final rule) shall lapse on August 31, 1980. However, if a copy of the grant of waiver is filed with the Office of Safety, FRA, prior to August 31, 1980, then the waiver shall be preserved. There is no requirement that the filing include a showing to justify preservation of the waiver.

Subpart B—Inspections and Tests

§ 229.21 Daily inspection.

The final rule reflects certain minor editorial changes in the NPRM and the addition of a new paragraph (c) that requires the inspection to be made by a qualified employee. Paragraph (c) is essentially the same as § 230.203(c) of the current rule. Deletion of the requirement that inspectors be qualified was opposed by RLEA, the State of New Jersey Department of Transportation (NJ/DOT), and the National Transportation Safety Board (NTSB). They further suggested that the FRA certify the persons who do the inspections. FRA does not believe that a comprehensive testing and certification program is warranted.

The final rule includes the change proposed in the NPRM to go from a 24-hour inspection to a calendar day inspection for locomotives in road service. This change was strongly supported by the AAR and several railroads, and strongly opposed by the RLEA and a local union lodge. The major objection to the calendar day inspection is that the possibility exists that railroads will do inspections late in the evening (11:59 p.m.) and then again in the early morning of the next day (12:01 a.m.). Thus, there will effectively only be a daily inspection every other day. The railroads disagreed, noting that it is impractical and inflexible to even attempt such a scheme. FRA does not believe that railroads desire to inspect or are capable of inspecting any significant portion of the road locomotive fleet in the manner suggested.

The RLEA and the NTSB also suggested detailing what a daily inspection should cover. The FRA disagrees with this judgment. To detail the names of all components and the many types of defects for each component would literally take pages. The list would do little to insure that a proper inspection is made and runs the risk of being incomplete. Under the final rule, as it was under the previous rule, the carrier is required to insure that the locomotive is in total compliance with the part.

The RLEA objected to the deletion of the requirement for approval of daily inspection reports by an official or responsible employee designated by railroad. The FRA believes that it is more important to have the person actually making the repairs sign the report. This reduces the opportunity for deception or mistake and insures that the repairs have been made.

The RLEA was opposed to permitting the continued use of a master report for MU locomotives (multiple operated electric locomotives). Their concern is that a non-complying locomotive would be difficult to track down. FRA is not aware that such a problem exists today, but in any event the final rule requires a separate, individual report for each non-complying MU locomotive. The final rule also provides that the separate report indicate the nature of the repairs that have been made and include the signature of the person making the repairs. Thus, MU and non-MU locomotives are treated the same in respect to the record of repair.

§ 229.23 Periodic inspection: General.

The final rule reflects a fundamental change from the NPRM. In the NPRM, the FRA proposed an inspection system that geared all tests to the periodic inspections. Thus, as opposed to making a test based on a time interval (e.g., every 12 months), all tests were to be made at periodic inspection intervals (e.g., every fourth periodic inspection). The final rule returns to a time interval system for all major tests.

The periodic inspection interval system of the NPRM was strongly attacked by AAR and most railroad commenters. Their objections were numerous. Most important among the issues raised, it was noted that the intervals for the major tests under proposed § 229.27 and § 229.29 would equate with the time period of the prior rule only if a railroad utilized the full 92 days between each periodic inspection. If a railroad employed an inspection system based on a 45 day or a 60 day periodic inspection interval then the major tests would have to be done at correspondingly shorter intervals. Thus, gearing the major test to periodic inspections would reduce a railroad's flexibility in its maintenance program and potentially could result in substantial additional expenses due to a shortened period between major tests. Several commenters also objected to changing from a time oriented system because the industry is familiar with the current system. Similarly, the use of consecutively numbered inspections was thought to be confusing.

FRA agrees that the periodic inspection interval system proposed in the NPRM is flawed. While tinkering with the system could resolve many of the problems raised, the advantages of the proposed system do not warrant the complexity that would result. Hence, FRA utilizes a time oriented system in the final rule for all major tests.

A second major objection to the system proposed in the NPRM was that the initial periodic inspection proposed in paragraph (d) is too comprehensive. AAR and numerous railroads pointed out that the initial periodic inspection would require completion of the air brake test under proposed § 229.27 (1 year air work) for all locomotives and completion of the air brake tests under proposed § 229.29 (2 year air work) for a significant portion of the locomotive fleet. Since this work is now spread out over an entire year, these commenters claimed that neither adequate facilities nor the necessary manpower are available to complete the work.

FRA agrees that compressing the air brake work into a 3 month period is not practical. Under the final rule the initial periodic inspection is no different than subsequent periodic inspections. The major tests under the final rule are to be done, as under the current rule, within the specified time interval. The dates of the previous tests done under the current rules are simply carried forward into the new system for purposes of determining when the tests become due under §§ 229.27, 229.29, and 229.31. If the locomotive is new, all tests required by the part shall be done either by the carrier or by the manufacturer prior to any use of the locomotive. The date of the tests by the manufacturer will determine when they are required to be made again by the carrier. Since § 229.33 provides for out-of-use credit, the date a locomotive leaves the factory for delivery effectively becomes the previous test date for the purposes of every requirement in the part if the test were done by the manufacturer.

Paragraph (b) and (g) of the proposed rule have been deleted from the final rule as a logical consequence of the change to a time oriented inspection system. These provisions are elements of a periodic inspection interval system and are no longer necessary.

Two aspects of § 229.23 sparked disagreement among the commenters. As anticipated, the proposed extension from a 30-day inspection interval (monthly inspection) to a 92-day inspection interval (periodic inspection) was strongly supported by AAR and numerous railroads, and strongly opposed by RLEA. FRA has retained the 92-day interval in the final rule.

As indicated in the preamble to the NPRM, FRA believes that modern electric and diesel-electric locomotives are capable of going 92 days without a major inspection. This conclusion is based on design and construction improvements that have occurred over many years. The rules applicable to locomotives have remained virtually unchanged for over 50 years.

An analysis of the accident data also supports a 92-day inspection interval. As indicated in the NPRM and confirmed by numerous commenters, a railroad locomotive is a safe work environment when compared to other work places. The number and severity of accidents and injuries is low.

While every accident and every injury is to be avoided, FRA believes that safety regulations should be rationally related to the safety risk. More important, given the finite resources available to the rail industry, those resources allocated to the rail safety area should be used to alleviate the more significant safety problems.

FRA believes that the inspection program of the final rule enhances rail safety. This is true for a number of reasons. First, the cost savings from extending the 30-day inspection to 92 days will enable additional resources to be used in accomplishing a more thorough daily inspection. It is the daily inspection that is the more important inspection for operational safety. FRA is fully prepared to assess civil penalties for non-complying conditions to insure that locomotives receive proper daily inspections. Second, the final rule requires that the periodic inspection may only be made where adequate facilities are available. In particular, the rule requires that the locomotive be positioned so that a person may safely inspect the entire underneath portion of the locomotive. Thus, the rule insures that the periodic inspection will be more thorough than the current monthly inspection.

The requirement for adequate facilities was the second area of disagreement among the commenters. AAR suggested substituting a requirement that periodic inspections be made only at location where "they can be made in a safe and workmanlike manner and with the locomotives positioned so that workmen may safely inspect it." FRA disagrees. AAR's language would eliminate the specific requirement relating to inspection of the underneath portion of the locomotive and it does not include any reference to facilities.

RLEA, on the other hand, suggested that the rule include a more specific requirement on the type of facilities and equipment that have to be available. FRA does not agree that additional detail is necessary or useful. The variety of rail operations, climates, and locomotives would require complex and cumbersome regulations. This should be avoided unless and until detailed regulations are necessary for enforcement of the underlying requirement.

As part of its comments on § 229.23, RLEA also questioned the deletion from proposed form FRA F 6180–49A of the requirement that any defects which have not been properly repaired be noted on the reverse side. RLEA said that the requirement serves a useful purpose of alerting persons to possible dangers on the locomotive resulting from improper repairs. FRA agrees. The final form FRA F 6180–49A includes the language from the old form regarding defects which have not been properly repaired.

§ 229.25 Tests: Every periodic inspection.

The final rule alters the proposed rule by deleting the test procedure for cable connections carrying 600 volts or more. Both the AAR and RLEA agreed that the procedure should be eliminated because it is potentially dangerous. The cables will have to be tested for continuity.

RLEA suggested that cables carrying less than 600 volts be tested. FRA believes that these cables are adequately covered by the requirements of § 229.89.

RLEA also suggested that the periodic inspection include an orifice test and a calibration of the ground relay. RLEA admitted that the orifice test is not an ideal means of testing the compressor but suggested keeping the test anyway until another test is developed. As indicated in the NPRM, FRA does not believe that the orifice test is useful in detecting a bad compressor. Neither does the FRA believe that calibration of the ground relay is necessary. The ground relay is essentially an equipment protection device. If it does not function properly, extensive damage to electrical equipment can occur. While an injury or accident could result from the damage to electrical equipment, the FRA believes that the requirement in paragraph (b) to inspect all electrical devices is an adequate inspection requirement. Also, the requirement in § 229.27(b) to test load meters provides an additional indication of the condition of a high voltage electrical system.

The AAR suggested that air gauges be tested at a longer interval than every periodic inspection (92 days). The FRA does not have any data to warrant an extension at this time, although FRA does agree that newer air gauges reflect technological advances over those employed in the past. However, FRA believes that these gauges form too critical a link in the brake system and the engineer's awareness of the brake system's functioning to extend the test interval without additional data.

§ 229.27 Annual tests.

The final rule is essentially the same as proposed in the NPRM. As requested by AAR and numerous railroads, the test interval has been changed from every fourth periodic inspection to at least once every 368 calendar days. This reflects the change from the periodic inspection system to a time based inspection system. Second, in response to comments by the Chessie System, the final rule specifically provides that the air brake work may be fragmented so long as an air record is maintained in the cab. The air record shall detail the date and place of the cleaning, repairing, and testing of each part of air brake system covered by paragraph (a). Chessie objected to the NPRM on the basis that its coordinated system ("Q system") of fragmented air work would be precluded. Chessie testified that the cost to change systems would be significant and that the "Q system" offers significant advantages in the management of locomotive maintenance. Actually, nothing in the NPRM precluded a fragmented system and nothing in the prior rule authorized such a system. However, the FRA agrees that the final rule should clarify that a fragmented system may be employed if an air record is maintained. If an air record is not maintained in the cab, then the air work shall have been done on the date indicated in the appropriate test date entry on form FRA F 6180–49A. This approach also addresses RLEA's concern that the engineer be able to determine from a record maintained in the cab that the air work has been performed.

The AAR and the RLEA disagreed with each other on the proper intervals for air brake work. AAR suggested that all annual air brake work under § 229.27 be transferred to the biennial test interval under § 229.29. Conversely, RLEA suggested that the biennial air work be transferred to § 229.27 and done on an annual basis. The AAR and RLEA also disagreed with one another on the extension from 6 months to 368 days of the requirement to clean, repair or replace filtering devices in the main reservoir supply line. As indicated in the NPRM, FRA believes the inspection interval extension for the main reservoir supply line filtering device is warranted by the currently available filtering devices.

Neither the RLEA nor AAR made a convincing case for altering the inspection interval for other components of the air brake system. RLEA's comment that there is no valid ground for distinguishing the frequency of required inspections of different portions of the air brake system is not persuasive. The time distinction is based on several grounds, including the degree of utilization and the design of the components. In any event, the RLEA's rationale only addressed the issue of uniformity and not the proper interval. By the same token, neither AAR's general references to advances in technology at the hearing nor its latter submissions to the docket on this issue are adequate from a data standpoint to justify an across the board extension of the inspection interval for these critical components. FRA has been and continues to be willing to enter into service test evaluations with the industry to more precisely define the inspection interval necessary for safety.

However, the inspection intervals for a small group of components have been altered. Most MU equipment was subject under the current rule to a single two-year inspection interval for all components, while older MU locomotives were subject to a single 15-month inspection interval (§ 239.408). Southeastern Pennsylvania Transportation Authority (SEPTA), Consolidated Rail Corporation (Conrail), Metropolitan Transportation Authority (MTA), and Port Authority Trans-Hudson Corporation (PATH) requested a uniform two year interval for MU locomotives. FRA agrees with these comments and has modified §§ 229.27 and 229.29 of the final rule to require that all air work on MU locomotives be done on a biennial basis. The long operational experience with the two-year interval for MU locomotives warrants its retention. The extension from 15-months to two years for the few MU's currently subject to the shorter inspection interval is reasonable in light of the experience with those MU's subject to the two-year period. Also, § 229.29(a) of the final rule has been amended to add MU locomotive brake cylinders since they are required to be cleaned, repaired and tested under the current MU rules. Thus, MU locomotives are treated under the final rule in essentially the same manner as under the currnt rule with respect to air brake cleaning, repair and testing.

Both RLEA and AAR agreed that the insulation dielectric test is potentially dangerous and was properly eliminated in the NPRM. RLEA suggested that an electric "leakage" test be required for high voltage circuits. FRA does not believe that a leakage test would serve a significant safety purpose since the high voltage equipment must be properly grounded (§ 229.83) and the electrical insulation and devices must be inspected at each periodic inspection (§ 222.25(b)).

§ 229.29 Biennial tests.

The final rule has been changed to reflect the time oriented inspection system rather than the periodic inspection interval system proposed in the NPRM. The air brake inspection intervals are discussed under § 229.27.

§ 229.31 Main reservoir tests.

The final rule reflects the time oriented inspection system.

§ 229.33 Out-of-use credit.

This section is essentially identical to the "out-of-service credit" provisions in §§ 230.31(c) and 230.451(e) of the prior rule. An "out-of-use" provision was not included in the NPRM because it was not necessary under the proposed periodic inspection interval system. However, since the final rule is a time oriented system, the out-of-use credit again becomes necessary.

Subpart C—Safety Requirement

§ 229.41 Protection against personal injury.

The final rule reflects the change in terminology from "high-tension" to "high voltage" and the addition of grid resistors to the list of components that shall be guarded. Grid resistors carry high voltage and are located where a person could come into contact with them. Otherwise it remains the same as proposed. RLEA suggested that high voltage be defined as 150 volts or more. This has been accomplished by the definition in § 229.5(g). RLEA also suggested that protection against hot liquids be included and that 100° Fahrenheit be the temperature level requiring protection. FRA does not agree that 100° Fahrenheit represents a safety hazard. Virtually every part of the engine room could exceed that temperature under normal operating conditions. The guarding requirement is designed to protect against the significant safety hazards posed by the exhaust manifold, steam pipes, and air compressor discharge pipe. Similarly, FRA does not believe that hot liquids pose a safety hazard of the same order as those components.

§ 229.43 Exhaust and battery gasses.

The final rule reflects a return to the language of the current requirement (§ 220.259) that means must be provided to prevent entry of products of combustion into the cab *under usual operating conditions.* This change has been made because it is impossible to prevent the entry of some fumes into the cab in certain unusual wind and weather conditions. RLEA questioned the relevance of exhaust stack height in preventing entry of fumes. FRA believes that stack height is the primary means of keeping fumes out of the cab and that a single height cannot be mandated since the particular characteristics of a locomotive type will warrant different stack heights. RLEA also suggested that FRA establish a range of new requirements for other types of fumes in the cab, especially gasses from locomotive batteries. The problem of gassing batteries was addressed in § 229.127(c) of the NPRM. The requirement that batteries be kept from gassing has been moved to § 229.43 in the final rule. The only change, suggested by the AAR and several railroads, is the addition of the modifier "excessively" to the requirement that batteries be kept from gassing. FRA agrees that a minute amount of gassing is normal. As to the other types of fumes mentioned by the RLEA, FRA believes that fumes associated with cab toilets fall into the maintenance rather than the safety sphere. This is a matter properly the subject of collective bargaining.

§ 229.45 General condition.

This provision remains the same as proposed. As indicated in the NPRM, it is designed to serve several purposes. First, it is a regulatory restatement of the requirement in the Act that all parts and appurtenances be in proper condition and safe to operate. Second, it is a condensation into one section of the many similar requirements that were scattered throughout the old rule. Third, it provides a shorthand way of dealing with components that are rarely found or are rarely defective. FRA acknowledged that the provision creates a degree of discretion in interpretation and application. The discretion was inherent in the prior regulations and is a necessary element given the variety and complexity of locomotives.

In general, the comments did not address these issues directly. On the one hand, the AAR, several railroad commenters, and one locomotive manufacturer objected to the provision on the basis that it is unnecessary due to the parallel requirements of § 229.7. Yet at the same time, objection was raised by many of these same commenters because of the presumed substantive significance of the section. FRA believes that the identification of components and conditions serves a useful purpose in implementing the more general statutory language. And while language such as "cracks, breaks, excessive wear, and other structural infirmities" leaves some room for interpretation, similar language is found in many other provisions of the final rule and was included throughout the prior regulations. Neither the legal enforceability, nor the hypothetical collateral consequences, nor the reasonableness of the discretion in the prior regulations were discussed by the commenters opposed to § 229.45. For example, two railroad commenters, Conrail and MTA, expressed concern that the language "cracked" is so vague that even surface cracks in third-rail shoe beams could be a violation. In fact, the prior regulations in §§ 230.240(b) and 230.435(b) used language ("loose, split, or cracked") that included cracked as one possible defect. Neither commenter indicated that the prior language had presented any problems or that FRA inspectors had interpreted this language in an unreasonable manner. FRA believes that the language in § 229.45, "conditions that endanger the safety of the crew, locomotive or train", provides the proper and lawful limit to the application of the section.

RLEA, on the other hand, commented that the section was not tough enough and that the discretion would result in few violations being taken. As with commenters who sought elimination of the section, the relationship of the language of the section to the language of the prior regulations was not discussed or analyzed. FRA believes that § 229.45 adequately addresses the components and conditions listed, and that the listing provides useful notice and additional guidance of what is intended by the broad statutory requirement.

§ 229.46 Brakes: General.

The final rule is the same as proposed. Only RLEA commented on this section. RLEA believes that the engineer specifically rather than the carrier should know that the brakes operate as intended. FRA does not believe that interfering in the method of carrier compliance with the requirements of this section is warranted. Requiring specific notification to the engineer is an added burden and could be extended by the same logic to include all components on a locomotive. At a minimum, the engineer can be assured that the calendar day inspection has been made by the record maintained in the cab.

RLEA also suggested that FRA add a requirement prohibiting a carrier from modifying the brake system on a locomotive until detailed plans of the modification have been approved by FRA. This issue is not appropriate to the revision of the locomotive inspection regulations. It would be properly raised in the context of the power brake regulations (49 CFR Part 232), which FRA intends to revise during the coming year.

§ 229.47 Emergency brake valve.

This provision has been modified in a number of small ways in response to comments by RLEA, AAR, and several railroads. First, the final rule clarifies that the requirements of the section apply only to locomotives operated in road service. This was what the prior rule required. Second, the requirement to have an emergency brake pipe valve

is no longer applicable to locomotives with cabs designed for occupancy by only one person. Instead, an emergency brake valve is required in the passenger compartment or vestibule. This change is necessary since many of the emergency brake valves located outside of the cab in the current locomotive fleet are not directly connected to the brake pipe. These valves are found on MU locomotives, which were not previously required to have an emergency brake pipe valve. Third, the requirement in paragraph (a) for the accessibility of the brake pipe valve is clarified by adding that it shall be accessible to a crew member, other than the engineer, from his or her position in the cab. This was what the prior rule required, although slightly different language was used. Locomotives that met the prior requirement will meet the requirements of the final rule.

§ 229.49 Main reservoir system.

Only one change has been made in this section. The requirement in paragraph (a)(2) for a separate control air reservoir has been modified to exclude MU locomotives built prior to January 1, 1981. Under the prior rule, MU locomotives were not subject to any control air reservoir requirements. Conrail and SEPTA indicated that some MU locomotives are not now so equipped. The FRA does not have either accident data or a convincing technical rationale to require retrofitting these locomotives.

Another commenter, RLEA, suggested that three safety valves be required in the main reservoir. No accident data or technical justification was offered and FRA does not believe that any safety justification exists for imposing this new requirement. RLEA also objected to deleting the requirement that there be a device in the air compressor discharge line to restrict the passage of oil throughout the air brake system. On this issue, the FRA and RLEA simply disagree on the effectiveness of the new requirement to drain oil from the air brake system before each trip (§ 229.46). FRA does not believe that a device is as effective as actually draining the oil from the system, although FRA expects that many railroads will probably continue to use those devices presently in service that restrict oil passage.

§ 229.51 Aluminum main reservoirs.

No change has been made. One commenter thought that this section could be deleted entirely since few, if any, locomotives use aluminum main reservoirs. However, FRA believes this section provides design guidance even if there are not any aluminum reservoirs now in use.

§ 229.53 Brake gauges.

Only one small change has been made to this section. In response to a comment by ICG, the requirement for brake gauge accuracy has been limited to air gauges. This has been done since hydraulic gauges may cover a pressure range of more than 1,000 pounds, with the smallest readable increment on the gauge face being 25 pounds. RLEA requested that the brake gauges be lit by three light bulbs. FRA believes the lighting requirements in § 229.127(a) are adequate. AAR, EMD, and several railroads suggested that gauge accuracy be limited to the operating portion of the gauge scale. FRA does not agree with these commenters. Gauges properly maintained will have an accuracy that meets the requirements of the section.

§ 229.55 Piston travel.

Several changes have been made to this section as a result of the testimony and written comments. In the NPRM, FRA proposed a single standard for the maximum permissible brake cylinder piston travel. The prior rule individually listed the maximum piston travel for various types of brakes. FRA proposed that brake cylinder piston travel may not exceed 2 inches less than its total possible piston travel.

This provision was critized by AAR on the basis that 2 inches of remaining piston travel is too stringent and by RLEA on the basis that 2 inches will not provide an adequate safety factor for all types of brake riggings and brakes.

FRA does not agree with RLEA's comment. First, the current list by brake type is essentially geared to preserving 2 inches of remaining piston travel. Therefore, a listing by brake type is not necessary. Second, FRA is not aware of any locomotive brake or brake rigging in use that would provide an inadequate level of safety if the actual remaining piston travel is at least 2 inches. In fact, as indicated in the analysis of the AAR's comments, FRA believes that 1½ inches of remaining piston travel is adequate from the standpoint of safety.

The AAR did not object to the approach that a single limit for piston travel be set. AAR, however, contended that the rule should provide that the brake cylinder travel may not exceed 1 inch less than the total possible piston travel. The 1 inch limit is based on the fact that power brakes are effective until the brake cylinder piston contacts the non-pressure head. It was AAR's view that 1 inch of remaining travel is, therefore, more than adequate. AAR stated that this conclusion took into account the fact that the piston travel on a moving locomotive utilizing its brakes is longer than the piston travel during a static brake test. This phenomenon, generally called the "dynamic effect", would result only in an approximately ⅛ to ¼ inch increase in piston travel according to the AAR.

FRA agrees with the AAR in part. After additional review and analysis, FRA agrees that the required remaining piston travel can be safely set at 1⅛ inches. FRA believes this will provide an adequate level of safety taking into consideration the frequency of locomotive inspection, brake shoe wear, and, most importantly, the dynamic effect.

However, FRA does not agree that the limit can be safely set at 1 inch. FRA believes that the dynamic effect is greater than stated by the AAR, potentially as great as 1 inch. Several factors can influence the additional piston travel resulting from the dynamic effect. First, the distance between the bearing and the side frame can vary (longitudinal clearance). Second, the clearance between truck components can vary, e.g., between the side frames and the bolsters. Third, the clearances between the brake beams and the truck components can vary. The cumulative effect of these factors, among others, can result in significantly more than ¼ inch additional piston travel in some situations. Hence, in order to insure safety across the entire range of possible operating situations and to provide an adequate safety margin, the final rule provides that the brake cylinder piston travel may not exceed 1½ inches less than the total possible travel.

Two additions have been made to the final rule. First, paragraph (b) now provides that the total possible brake cylinder piston travel shall be entered on form FRA F 6180–49A. This information is necessary so that the persons conducting the daily and other inspections will be able to determine the amount of remaining piston travel. Second, a new paragraph (c) requires that the minimum brake cylinder pressure shall be 30 pounds per square inch. This provision is implicitly required by current 49 CFR 232.10(n). It is a design standard included for the sake of clarity and will not have any cost or operational impact.

§ 229.57 Foundation brake gear.

The final rules have been modified to prohibit a broken or missing lever, rod, brake beam, hanger, or pin. A broken or missing component is obviously a greater hazard than a worn one. AAR and UP suggested that only cracks

extending through more than 30 percent of the cross-sectional area of a component should be prohibited. FRA disagrees. A crack, unlike ordinary wear, is a structural infirmity that has the potential to progress rapidly to failure.

The RLEA suggested that cotters be required when nuts are used and that the rule prescribe requirements for pins without threads. FRA disagrees. The suggestions of the RLEA are maintenance oriented. The requirements of the section comprehensively address the critical safety problems of the foundation brake gear.

§ 229.59 Leakage.

The final rule remains as proposed. AAR suggested that paragraph (b) specify a test procedure for brake pipe leakage. FRA does not agree because the leakage limitation is intended as a requirement applicable during the entire period of use. Similarly, FRA does not agree with RLEA's suggestion that leakage be reduced from 5 pounds per minute to only 3 pounds per minute because the leakage limitation requirement is not restricted to the controlled circumstances of a test. The leakage limitations apply during the entire period of use. RLEA also requested that the "minimum reduction" and "maintaining feature" on type 26 brake valves be tested. FRA does not believe that specific tests are necessary since these features have to operate as intended in order to meet the requirements of § 229.46. With respect to RLEA's concern about brake outlet vent noise levels, this concern is addressed in the section on locomotive cab noise (§ 229.121). The overall cab noise level is more important than individual noise sources.

§ 229.61 Draft system.

The final rule has been modified in language but not in substance. An updated coupler diagram (Figure 1) is included, resulting in a language change in paragraph (a)(2). The diagram is the same as used in the recently revised Freight Car Safety Standards. The term "draft gears" has been added to paragraph (a)(4) to clarify that draft gears may be used to absorb free slack. RLEA suggested that side to side movement of couplers be regulated. FRA is not aware of any safety problem in this area that warrants Federal regulation. For many years locomotives have been designed with features that restrict side to side movement.

§ 229.63 Lateral motion.

The final rule has been modified in several respects. First, the total uncontrolled lateral motion permitted on friction bearing power axles is set at 1 inch. This was the limit for MU locomotives under the prior rules and several railroads indicated that the limit should be retained on MU locomotive powered axles with friction bearings. FRA agrees that a 1 inch limit for friction bearings is appropriate for MU locomotives and also for non-MU locomotives. Second, the total uncontrolled lateral motion on the center axle of three axle trucks is set at 1¼ inches. AAR and UP requested 1⅞ inches for center axles on three axle trucks because the additional lateral motion reduces the lateral load on curved rail. FRA agrees that permitting additional lateral motion on the center axle of three axle trucks is justified. This conclusion is based on the extensive tests which indicated that the lateral forces on the track did not increase as the lateral motion of the center axle rose to 1¼ inches. However, the tests did not include lateral motion of the center axle in excess of 1¼ inches. Hence, FRA has set that figure as the upper limit until additional data is available.

RLEA made extensive comments concerning uncontrolled lateral motion, most of then related to the problem of three axle trucks. FRA agrees that certain three axle trucks have presented a special problem and FRA has made a number of tests and studies relating to them. FRA does not believe that a reduction in the maximum permissible uncontrolled lateral motion is warranted for locomotives generally or even for three axle truck locomotives. Available data does not indicate that high lateral forces are a problem with most locomotives. With respect to three axle trucks, the final rules address a specifically identified problem involving lateral forces by limiting the variation between wheel sets (§ 229.73(b)). RLEA also requested that carriers be required to maintain bolster stops and wear pads in accordance with the manufacturer's specification. FRA believes that these are essentially maintenance items, not direct safety hazards.

§ 229.64 Plain bearings.

Only one commenter addressed this section, RLEA. The commenter noted that roller bearings were not specifically covered by this section. FRA agrees that roller bearings are not covered. The section addresses the need for free oil in the bearing box. Roller bearing lubricant is enclosed within the roller bearing itself. Thus, roller bearings do not logically fit with plain bearings. FRA believes that roller bearings can be dealt with through the general condition requirement, as it has been in the past. Therefore, the final rule has not been changed.

§ 229.65 Spring rigging.

The final rule reflects the numerous comments that shock absorbers are designed to permit "weeping" or minute leaking of fluid. Therefore, the final rule follows the language of the freight car safety standards and provides that a shock absorber may not be leaking "clearly formed droplets."

RLEA objected to the proposal to allow one elliptical spring in a nest of at least three springs to have a broken long leaf or any other three leaves broken. RLEA's concern was that the truck bolster would not remain level and that the side bearings would bind. FRA does not agree that this will occur in the usual case. However, the FRA has residual authority to remove from use any locomotive that has an unsafe condition.

RLEA also requested that the rule be extended to include air ducts in the bolster and plastic pedestal liners. The safety rationale for including them was not spelled out and the FRA does not have any information to indicate a safety problem.

§ 229.67 Trucks.

No change has been made to this section. RLEA suggested that the section should have condemning limits for axles. However, violation of any limits set could not be ascertained by any visual inspection of roller bearings and would be difficult to enforce in the case of friction bearings. In any event, this is essentially a design and maintenance issue. Any obvious dangerous conditions can be handled by use of the Special Notice for Repair or § 229.45.

§ 229.69 Side bearings.

No comments were received and no changes has been made.

§ 229.71 Clearance above the rail.

The final rule provides that trip cock arms may be less than 2½ inches above the rail. This change was made in response to a comment from PATH that such equipment is now in use and after FRA's evaluation that these devices do not present a safety hazard. The final rule is otherwise the same as proposed.

§ 229.73 Wheel sets.

The RLEA objected to the proposal in paragraph (a) to set the maximum variation in circumference of wheels on the same axle at two tape sizes (one tape size is equal to ⅛ inch). Their objection was that this new limit is too high and will lead to severe "hunting". FRA believes RLEA misunderstands the impact of the rule. The prior rule

(§ 230.226(b)) permitted a 3/32 inch variation in the *diameter* of the wheels. When translated into wheel *circumference* variation, the prior rule permitted a variation of 2.35 tape sizes. Therefore, the rule as proposed reduced the permissible wheel variation on locomotives except MU locomotives. FRA has adopted paragraph (a) as proposed. The use of tape sizes more accurately reflects the method currently used to measure wheel variation.

The AAR, EMD, and four railroads commented on paragraph (b)'s restriction on the variation in the diameter of wheel sets on three axle trucks. The commenters were in agreement that shimming at the journal box springs to compensate for wheel diameter variation can resolve the underlying problem—unequal axle loading. They suggested that a larger variation in the permissible wheel set differences be allowed when shimming is used. FRA agrees that shimming can impact axle load equalization. The final rule provides that the maximum variation may not exceed 1¼ inches when shims are used.

With respect to paragraph (c), EMD suggested that a tolerance of 1/16 inch be permitted on the high side for wide flange wheels. That is, EMD proposes that the maximum distance between the inside gauge of the flanges be 53 5/16 inches. EMD testified that their "unipoint" wide flange wheels may not always meet the 53¼ inch limit because they are manufactured at the outer boundary of the permissible limit. The rule as proposed would not leave a tolerance for manufacturing error. FRA has not increased the maximum distance in the final rule because any increase above 53¼ inches for wide flange wheels could result in direct interference between the wheels and the rails. The possibility of direct interference must be prevented from the moment the wheels are first used and not wait until the wheels are trued for the first time after entering use.

RLEA objected to the limit for the variation in back to back distance for wheels on the same axle. Section 229.73(d) is identical to the prior rule in §§ 230.226(d) and 230.420(d). RLEA did not indicate any safety problem associated with continuing the previous limits and FRA is not aware of any safety problem.

§ 229.75 Wheel and tire defects.

Two minor changes from the NPRM are included in the language of the final rule. Paragraphs (b) and (d) have been revised to follow the language of the freight car safety standards.

RLEA objected to the change from 1½ to 2½ inches in the maximum permissible length of a flat spot on MU locomotives. This change occurred as a result of merging subparts C and D of Part 230. FRA does not believe that permitting the same flat spots on MU locomotives that have long been allowed on generally heavier diesel locomotives will impair safety. While it may affect the ride quality of the MU locomotive, it does not present a safety problem. Accordingly, FRA believes that MU wheels will be changed out or trued for operational reasons before flat spots begin to reach condemning limits.

RLEA commented that any chipped or brokem flange should be a safety defect, not merely those more than 1½ inches in length as provided in paragraph (b). RLEA referred to the prevalence of rough track and the small size of wheels for justifying this approach. FRA disagrees. The 1½ inch standard has been in effect or many years. FRA is not aware of any data that locomotive wheels have an increasing failure rate or that small chips or gauges create an unsafe condition.

RLEA also objected to the proposed change in paragraph (d) from 1½ inches to 2½ inches in the maximum permissible length of a shelled-out spot on MU locomotives. FRA disagrees for the reason indicated in the discussion of flat spots in paragraph (a). PATH suggested that the size limit on a spall be altered to permit a spall 1½ inches long. FRA has decided to delete the spall requirement entirely. The reason for deleting the requirement is the great disagreement about how to distinguish a spall from a shelled-out spot. From an enforcement standpoint as well as from a safety standpoint, FRA believes that they should cover a single requirement.

RLEA objected to the change in paragraph (f) to permit a reduction in the flange thickness requirement from 1 5/16 to ⅞ inch. FRA does not agree with the commenter. As stated in the NPRM, the former wear limits were developed at a time when cast iron wheels were in widespread use. Since that time, the introduction of steel wheels and improved manufacturing techniques have significantly improved the strength and durability of wheels. Accordingly, the wear limits set forth in the proposed rule have been incorporated into § 229.75(f).

RLEA asked a new section be added that sets a mileage limit for locomotive wheels. FRA disagrees because mileage is not a good indicator of a defective wheel. Type of track, type of service, type of wheel, and other factors affect wheel life. The critical issue is the condition of the wheel irrespective of the mileage. The final rule adequately addresses unsafe conditions of wheels.

Finally, AAR and several railroads expressed concern about paragraph (m), fusion welding of wheels. Paragraph (m) provides that fusion welding may not be used on wheels of locomotives except on yard locomotives in limited situations. These commenters were concerned that the rule would preclude emergency repairs of wheels by fusion welding after an accident, something which is now done. Leaving aside the fact that the language in the NPRM giving rise to the concern is essentially identical to the prior rule, the consequence of non-compliance with this requirement, as with any other non-compliance, is that the locomotive must be moved in accordance with § 229.9, movement of non-complying locomotives.

§ 229.77 Current collectors.

No change.

§ 229.79 Third rail shoes and beams.

No change.

§ 229.81 Emergency pole; shoe insulation.

Paragraph (a) of the rule has been revised by providing that the requirement to mark the part of the pole that is safe to handle is not required if the entire pole may be safely handled. This change addresses the comments by AAR and three railroads that modern poles are constructed of insulating material and that there is no portion of the pole which cannot be handled safely when in use.

§ 229.83 Insulation or grounding of metal parts.

No change.

§ 229.85 Doors and cover plates marked "Danger".

The final rule indicates the option to use the phrase "Danger—High Voltage" or to use the word "Danger" and the normal voltage carried by the parts so protected. This change, requested by AAR and two railroads, has been made because FRA believes the alerting quality of the phrase "Danger—High Voltage" is adequate. The term "high voltage" is defined in § 229.5(g).

§ 229.87 Hand-operated switches.

No change.

§ 229.89 Jumpers; cable connections.

RLEA commented that the section should expressly include control wires between locomotives in a locomotive consist. FRA believes that all control

wires between locomotives are covered by the language as proposed, i.e., "cable and jumper connections." Further, FRA believes that the list of non-complying conditions in paragraph (b) adequately deals with the problems of shorts and grounds in cable and jumper connection. Hence, the final rule remains as proposed.

§ 229.91 Motors and generators.

The final rule reflects two revisions. First, the word "excessively" has been added to modify the restriction against a motor throwing solder. This change has been made because electrical motors generally throw minute amounts of solder in normal use. The AAR and several railroads requested clarification of this requirement. Second, the requirement in the previous rule restricting oil on motors and generators has been preserved in the final rule. RLEA reiterated the justification outlined in the previous rule that oil can lead to fire hazards. FRA has concluded that the risk of electrical fires warrants retention of the requirement.

RLEA also commented that motor support bearings should be inspected. FRA believes that this is a maintenance item. While maintenance is related to safety since improper or inadequate maintenance can eventually lead to component failure, it is not the proper subject of detailed Federal requirements. FRA has ample authority to deal with specific unsafe instances involving motor support bearings.

§ 229.93 Safety cut-off device.

The requirement in the NPRM for a "safety cut-off valve" has been modified in the final rule to require a "safety cut-off device." The word "device" is designed to encompass mechanical, electrical, or gravity systems that insure a positive cut-off of the fuel supply to the internal combustion engine and the steam generators. This change is made because many locomotives in use are equipped with an electric device rather than a valve. These have had FRA sanction and have performed properly, as was noted by AAR, EMD, and several railroads.

§ 229.95 Venting.

RLEA commented that the prior requirement for a fuel gauge should be retained. RLEA's reasoning was that a gauge will prevent a locomotive from running out of fuel enroute and that it will reduce spillage of valuable fuel. As was stated in NPRM, while "a gauge may be useful, the FRA does not believe it is necessary from a safety standpoint."

§ 229.97 Grounding fuel tanks.

No change.

§ 229.99 Safety hangers.

No change.

§ 229.101 Engines.

The final rule has been modified to provide that wheel slip/slide protection shall be provided whenever required by § 229.115, even if the locomotive engine displays the proper warning notice. So long as slip/slide protection is provided whenever required by § 229.115, a locomotive with an inoperative engine displaying the required warning notice may continue in use. This change has been made as a result of the revision to § 229.115, slip/slide alarms. The issues concerning the underlying requirement for wheel slip/slide protection are included in the discussion of § 229.115.

§ 229.103 Safe working pressure; factor of safety.

See the discussion on § 229.113.

§ 229.105 Steam generator number.

See the discussion on § 229.113.

§ 229.107 Pressure gauge.

See the discussion on § 229.113.

§ 229.109 Safety valves.

See the discussion on § 229.113.

§ 229.111 Water-flow indicator.

See the discussion on § 229.113.

§ 229.113 Warning notice.

Sections 229.103 to 229.113 are all related to steam generators. Very few comments were received on these provisions and they are discussed as a unit.

RLEA commented that the water bypass regulator or thermostat leading into the fire box should be required to function properly. These devices are part of the system that insures the steam generator will shutdown if there is a water deficiency. FRA agrees that those components are important, which is why § 229.25(d)(1) requires that "all controls, alarms, and protective devices shall be inspected and tested" at each periodic inspection. FRA does not believe that separately listing and regulating each component adds to rail safety or expands FRA's ability to deal with obvious unsafe conditions. RLEA also suggested relocating the steam generator identification number and using the terminology "flash type boiler" rather than steam generator. FRA prefers the more commonly used term "steam generator" and does not see any safety benefit in requiring the relocation of the identification number. Finally, RLEA expressed concern about possible personal injury stemming from steam leaks and steam pipes. FRA believes that these concerns are directly and adequately addressed in §§ 229.41 and 229.45.

The AAR and UP also commented on these sections. UP expressed concern that the phrase "illuminated steam gauge" in § 229.107 would not permit illumination by an external light source. FRA agrees that external lighting should be allowed since the majority of gauges are currently illuminated in this manner. No change has been made, however, since FRA believes the language of the final rule permits external illumination.

AAR expressed concern that continued use of a locomotive with an inoperative steam generator displaying a warning notice would not be permitted beyond the next periodic inspection. AAR apparently believes that a locomotive with an inoperative steam generator displaying a warning notice should be able to continue in use indefinitely. FRA disagrees. A warning notice is too impermanent a method. However, under § 229.23(b), a locomotive may continue in use indefinitely with an inoperative steam generator if certain permanent safety precautions are taken.

§ 229.115 Slip/slide alarms.

The final rule has been altered in several ways in response to numerous comments. First, RLEA objected to the exclusion of MU locomotives from the slip/slide requirements of the NPRM. In fact, under the NPRM and the final rule MU locomotives are included in the prospective design reqirement that locomotives shall have a wheel slip/slide device that detects wheel slip/slide for each powered axle. FRA has not made the wheel slip/slide requirements applicable to older MU's because they were not previously required to have the devices. The enormous cost of retrofitting them is not warranted in the opinion of the FRA. There is not any MU accident data to support a retrofit burden. Moreover, many MU locomotives have some type of slip/slide protection, although some of the devices do not produce a visual or audible warning in cab. However, FRA does agree that these devices on MU locomotives are appurtenances within the meaning of the Act. Hence, the requirements in paragraph (b) regarding the functioning of wheel slip/slide devices is applicable to all equipped locomotives in road service.

Second, RLEA suggested that the required device should have both a visual and an audible alarm. FRA does not agree. The additional expense,

particularly the retrofitting expense, is not warranted in the FRA's opinion. The limited accident data relating to slip/slide devices indicate a possible problem only when the device is not functioning. There is no evidence that the lack of redundant alarm mechanisms has ever had any adverse safety impact.

Third, EMD and several railroads expressed concern that the design requirements for wheel slip/slide devices in this section meant that the devices must operate under all conditions. These commenters stated that there is not any device currently available that will detect wheel slip/slide in all circumstances. For example, locomotives produced by EMD will not give wheel slip/slide indications for an axle when power to that axle is shut off. FRA agrees that this issue should be clarified in the final rule. Hence, paragraph (c) provides the device shall detect wheel slip/slide for each powered axle when it is under power. This does not necessarily require a separate device for each axle, only that slipping or sliding on any power axle under power be detectable.

Fourth, AAR and numerous railroad comments expressed great concern that the NPRM expanded the situations where the absence of wheel slip/slide protection would be treated as non-compliance with the requirements of the locomotive rules. Under § 229.101 of the NPRM, a locomotive with an engine shutdown that has the effect of negating wheel slip/slide protection could only move to the nearest point or the nearest forward point where repairs necessary to restore wheel slip/slide protection could be made. In the preamble to the NPRM, the FRA indicated that this was what it believed the old rule (§ 230.201(d)) required, but noted that there was substantial confusion about the meaning of the wheel slip/slide provision. One implication of this admittedly restrictive interpretation is that all powered axles on locomotives in road service must be under power at all times if being under power is necessary to obtain wheel slip/slide protection.

The commenters strongly stated that this interpretation is not how § 230.201(d) has been interpreted in the past and that there are significant reasons why it should not be now interpreted in that manner. For example, a locomotive in the consist would not be permitted to have the power cut to its propelling motors to achieve fuel saving or to prevent excessive retardation from dynamic brakes or excessive tractive effort on curves.

Even more important to the railroad commenters, the requirement to drop off at the next repair point any locomotive in the consist that has had any type of enroute problem resulting in the absence of wheel slip/slide protection will have tremendous adverse impacts on railroad operations. The railroads contend that under the prior rules a locomotive could remain in the consist until the end of the run. To stop the train and break up the consist to remove a locomotive that does have wheel slip/slide protection for each powered axle because, for example, of ground relay problems would cost the railroad industry hundreds of millions of dollars according to the AAR.

Finally, the railroad commenters pointed out that each day many locomotives are moved dead in the train or dead in the consist for purposes of power distribution. The absence of any accident data relating to these movements indicates that wheel slip/slide protection is not critically related to rail safety at least in those instances where the powered axles are not under power.

FRA agrees that the points raised in these comments have merit. After a more detailed evaluation of the accident data, the safety relatedness of the wheel slip/slide device, and the prior practices as evidenced by the testimony at the public hearing, FRA has modified the final rule to address those areas essential to safety. In particular, paragraph (b) of the rule clearly and explicitly provides that the wheel slip/slide devices on locomotives operated in road service must be functioning properly for each powered axle under power at each calendar day inspection and at the point of dispatch. Moreover, a powered axle not under power must be capable of functioning properly if it were under power. Implicit in this requirement is that the locomotive must be capable of supplying power to the powered axles not under power and that tractive devices are capable of providing tractive effort. Absence of wheel slip/slide protection enroute is not a non-complying condition, even if it results from an engine problem subject to the warning notice requirement of § 229.101.

FRA believes that this approach addresses the central safety concerns. First, the rule requires that slip/slide devices be properly functioning at the daily inspection and the point of dispatch. Second, the rule requires that the device be actually functioning on powered axles under power. An axle under power has additional stress that makes the slip/slide device a critical safety device on locomotives in road service. Third, it clarifies that locomotives may be hauled dead in consist or dead in the train for purposes of power distribution without violating the wheel slip/slide requirement so long as the locomotive is otherwise in compliance with the part.

§ 229.117 Speed indicators.

The final rule has been modified in several respects as a result of the comments received. Paragraph (c) of the NPRM has been deleted. It provided that the speed indicator shall be readable by a member of the crew other than the engineer when the cab is designed to be occupied by more than one person. Despite the belief that it is advantageous to have a second crew member be aware of the speed of the train, FRA agrees with the commenters that indicated that additional costs outweigh the benefits. On some locomotives a single speed display is now being utilized. However, according to several commenters, a dual display would be necessary on many locomotive types. The costs of modifying the cabs of locomotives or of installing dual displays is substantial, especially in light of the tentative safety benefits.

RLEA, AAR, and several railroad commenters testified in favor of speed indicators or indicated that they did not oppose a speed indicator requirement. There were disagreements among the commenters regarding the scope of the requirement and on certain technical details. RLEA favored speed indicators on any locomotive used as a controlling locomotive at speeds in excess of 5 miles per hour (m.p.h.). AAR and several railroads, on the other hand, wanted the requirement limited to locomotives regularly used in road service at speeds in excess of 20 m.p.h. FRA has adopted the language of the NPRM. The speed of the locomotive rather than the type of service is the critical factor. However, FRA does not believe that the marginal benefit of speed indicators on locomotives routinely operating at very slow speeds warrants the cost. Most locomotives that operate over 20 m.p.h. are outfitted according to FRA data, as was noted in the NPRM, while few of the locomotives that routinely operate at less than 20 m.p.h. are so equipped.

Rail labor and the rail industry also differed on the degree of accuracy that should be required. RLEA suggested that the indicator be accurate to within 5 percent at speeds below 60 m.p.h. and to within 3 m.p.h. at greater speeds. AAR, EMD, and several railroad commenters indicated that indicators should be accurate to within ±5 m.p.h. The only detailed technical analysis came from those commenters who suggested the ±5 m.p.h. accuracy level. FRA has analyzed their comments in detail, especially the formula included in

EMD's comments. Taking into account the inherent inaccuracy of the devices and the tolerance due to wheel diameter variation, FRA agrees that at higher speeds the 3 m.p.h. tolerance may be too strict. However, at lower speeds the impact of wheel diameter variations is not as great and the 3 m.p.h. tolerance is reasonable. Hence, the final rule provides the indicator shall be accurate within ±3 m.p.h. of actual speed at speeds of 10 to 30 m.p.h. and accurate within ±5 m.p.h. at speeds above 30 m.p.h. FRA does not agree with RLEA that the marginal additional accuracy that can be achieved by recalibrating each time the wheel is turned or replaced warrants Federal regulation. It is a good time to test and calibrate the speed indicator, however, and is encouraged by FRA as a good maintenance practice.

A number of comments addressed the impact of the speed indicator requirement on MU locomotives. PATH's MU locomotives are not equipped with speed indicators and PATH opposed any requirement that they be retrofitted. NJDOT noted it owned about 220 older MUs, scheduled to be retired by 1983, that are not equipped with a speed indicator. While supporting a speed indicator requirement, NJDOT requested that it not apply to older MUs. Similarly, MTA has 87 older MUs which are scheduled to be equipped with cab signal system with speed indicator by December 31, 1981. MTA requested a delay in the compliance date to avoid the unnecessary costs associated with using an interim speed indicating device. Finally, Conrail suggested that requirement for a speed indicator on MU locomotive be limited to those built after 1965. The rationale was to avoid equipping cars that will be retired in the near future. FRA neither agrees nor disagrees with the merits of the particular situations described. FRA believes that speed indicator requirement should be a requirement of general applicability. Each of the four MU commenters sets forth a situation which could give rise to a waiver if full development of the facts indicate that it would be in the public interest and consistent with railroad safety.

Finally, several commenters opposed the requirement to test the accuracy of the speed indicator after departure. They objected to it because it is an operating rule in their opinion and not properly encompassed under the Act. The requirement to test components on a locomotive is clearly within the scope of the Act. Non-compliance with any test or inspection requirement under Part 229 is a violation even if the component or locomotive that should have been tested is in proper condition. The language allowing the carrier to use a speed test section or equivalent procedure is designed to provide flexibility to deal with the particular operating characteristics and preferences of each carrier.

§ 229.119 Cabs, floors, and passageways.

Section 229.119 received numerous comments. Paragraph (a) relating to cab seats and cab doors, is adopted as proposed. It was strongly supported by RLEA. EMD objected to the language becaused it does not provide detailed test parameters for determining compliance with the requirement. EMD expressed concern from the standpoint of product liability. FRA has not adopted detailed test procedures. FRA's primary safety concern in the area of cab seating is maintenance, not design, and FRA does not believe that the language is unreasonable.

Paragraph (b) is also adopted as proposed. RLEA opposed the performance standard in paragraph (b) for visibility through cab windows and suggested that defrosters, windshield wipers and glass without cracks be explicitly required. FRA disagrees, believing that a performance standard is preferable. Defrosters, for example, are not necessary for rail operations in certain parts of the country. FRA believes that the performance standard requiring an undistorted view of the right-of-way is sufficient to require railroads to properly maintain all devices necessary to meet that standard. It should be noted that the requirements of paragraph (b) are in addition to the safety glazing standards, 49 CFR Part 223.

Paragraph (c) is adopted as proposed. RLEA suggested that the phrase "properly treated to provide secure footing" should be replaced with the Flooring Agreement of Clean Cab Committee. Agreement by interested private parties should not be impeded by unnecessary Federal regulation. Moreover, if some locomotives do not meet the precise requirements of the Flooring Agreement, FRA does not believe that they should be required to retrofit the flooring so long as it provides secure footing.

Paragraph (d) has been modified to provide reference points for measuring the cab temperature. Several commenters indicated that measuring points are necessary for effective enforcement. FRA agrees and the final rule provides that the temperature shall be at least 50 degrees Fahrenheit 6 inches above the center of each seat in the cab. This will insure that the minimum temperature is met at each point in the cab that is designed to be occupied by a member of the crew. The final rule is more stringent than the prior rule which limited the measuring point to the center of cab, a point impacted less by poor weather-sealing of the cab and proximity to cold surfaces. FRA has not raised the minimum temperature as requested by RLEA. The 50 degree figure is a safety minimum and FRA agrees that a higher figure is perferable. However, most locomotives operate with cab temperatures well above the minimum in winter operations.

The cab sealing requirement in paragraph (e) of the NPRM is not included in the final rule. AAR, every railroad commenter, and both locomotive manufacturers strongly objected to this proposed requirement. Only one commenter, RLEA, was even mildly favorable. RLEA questioned the value of the proposed requirement since it would only address forward facing openings. RLEA suggested a comprehensive approach to protecting persons in cab, including collision impact, roll-over protection, anti-climbing protection, and sealing the cab against the entry of flammable materials through any opening.

FRA agrees with those commenters who stated that the proposed rule lacks sufficient specificity and technical detail to be a useful requirement. It was envisioned as a means of incorporating the agreements reached in the Clean Cab Committee to put a solid barrier behind number lights, marker light, and head lights and to seal the nose doors of car body type locomotives. FRA has concluded that any action in this area should await development of adequate technical specifications. In particular, FRA hopes that voluntary agreement by the industry in such forums as the Clean Cab Committee will resolve many of the issues of the cab environment without Federal regulations.

Paragraph (e) of the final rule is identical to paragraph (f) of the NPRM. The rule uses the same language, "continuous barrier," that was used in § 230.229(g). Several commenters expressed concern that chains would not be acceptable under the rule. Chains will be acceptable to the same extent as under prior rule.

Paragraph (f) of the final rule is essentially identical to paragraph (g) of the NPRM. It has been altered to clarify that only torpedoes have to be kept in closed metal containers. This corresponds to the requirements of the old rule. FRA inadvertently included fusees with torpedoes in the NPRM's

proposed requirement relating to closed metal containers.

As part of its comments on § 229.119, RLEA proposed that the rule include a number of new substantive requirements. These items, many of which are beyond the scope of the notice of proposed rulemaking, include minimum cab floor space requirements, clean cab requirements, position of the engineer in the cab, detailed specifications for cab seats, drinking water requirements, layout of indicators and controls in the cab, uniformity of cab design and location, air conditioning, air filter requirements, and crashworthiness of the cab. NTSB also addressed the crashworthiness issue. FRA does not believe that any of these items warrant action at this time for a variety of reasons. Some are already being addressed without Federal regulation through voluntary action, e.g., Clean Cab Committee. Others are more properly the subject of collective bargaining. Many are not significantly related to rail safety or have not been justified on a cost/benefit basis. With respect to the issue of crashworthiness, FRA believes that additional study is necessary to develop meaningful standards. A study is presently being made by FRA with a final report tentatively scheduled for completion in 1982.

§ 229.121 Locomotive cab noise.

This section sparked numerous comments. AAR and several railroad commenters did not believe that FRA should adopt an occupational noise standard for the locomotive in-cab environment. Specifically, they questioned the justification for such a regulation due to an absence of accident data or medical evidence linking crew member impairment to high noise exposure. It was also contended that this occupational noise standard, adopted from that contained in the Occupational Safety and Health Administration (OSHA) regulations, was not appropriate for the railroad environment. The extensive litigation and controversy surrounding its enforcement were cited to support their claim that it should not be applied across-the-board to all industries. Finally, the commenters alleged that economic feasibility was an important determinant and questioned whether FRA had considered the cost effects of this standard, or whether a means of compliance had been determined.

Despite the concerns expressed above, the FRA believes that regulation in this area is warranted. Medical and accident data cannot always be correlated with noise exposure. Frequently, noise induced hearing loss is not recognized for many years, and even then is not always associated with working conditions, but dismissed as hearing loss due to advancing age (presbycusis). Thus, occupational illness data may not reliably indicate the true nature of an occupational noise problem.

It is now generally accepted that extended periods of exposure to high noise levels cause varying degrees of temporary and permanent hearing loss. Aside from hearing loss, exposure to high noise levels has also been related to changes in cardiovascular, endocrine, neurologic, and other physiologic functions. All of these are suggestive of a general stress reaction with resultant complaints of fatigue and irritability. Although the effects of these reactions on accident rates cannot be quantified, noise level distraction from normal surveillance of wayside signals and from locomotive controls can be a significant causal factor.

As far as the cost effects and economic feasibility of this regulation, FRA estimates that less than 5 percent of the locomotives now in service produce interior noise levels in excess of the prescribed limits. A substantial proportion of these can be brought into compliance by relatively simple maintenance procedures, such as improving seals and gaskets or replacing missing electrical cabinet panels. Also, substantial noise reductions can be achieved in the areas of controlling air brake exhaust and excessive horn noise in the cab. Reduction of horn and air brake noise is the most significant factor in regards to crew exposure and is the most cost effective approach. The following discussion identifies some engineering controls that have been utilized in these areas.

Major locomotive manufacturers presently offer, as an option, a method for piping the automatic brake valve service application and independent brake valve exhaust into the sub-base of the locomotive. This option provides an audible indication of brake performance while, at the same time, it has been estimated to reduce the cab occupants' noise dosage by 15 to 20 percent. It is available at an additional cost of approximately $100 to $150, and is presently specified by two railroads for their new units. One railroad has retrofitted their existing equipment as well.

Excessive air horn noise in the cab is most easily controlled by proper location of the horn on the locomotive. It should be away from air vents and not located on the cab roof in close proximity to any crew member's seat. It is estimated that relocation can be accomplished at labor costs of less than one hour.

The costs involved in lowering employee exposure to noise may be balanced by reduced compensation costs associated with high noise work environments. A recent analysis of the Federal Employers' Liability Act cases of five railroad employees seeking compensation for occupational hearing loss showed that they suffered from 37 to 82dB hearing loss and received awards of a mean value of $32,000.

One commenter stated that the cab noise standard was unnecessary because newer locomotives are quieter than the older ones, and that the cab noise situation will improve even more due to the EPA wayside noise standards.

FRA does not disagree with the contention that locomotives are now, generally speaking, quieter than those built in the past. However, these older units may remain in service for many years. As far as the effect of the EPA standards on interior noise levels, based on test data from major locomotive manufacturers, it appears that the noise reduction techniques incorporated in the post-1980 units to meet exterior passby noise standards will have little or no effect on the interior cab noise environment.

One commenter recommended that the interior cab noise standard only apply to new locomotives. It was questioned whether it would be prudent to retrofit locomotives that were very close to being retired.

FRA does not agree that a blanket exemption to this regulation is appropriate for existing locomotives. As previously mentioned, these units may remain in service for many years and, if required, can often be brought into compliance by the implementation of the maintenance procedures or the identified methods to reduce horn and brake noise in the cab.

The cab noise requirement becomes effective on September 1, 1980, and the compliance time between issuance and the effective date provides ample time for any retrofitting that may be required. Of course, an application for waiver of this standard may be appropriate for those special cases where it can be demonstrated that retrofit is not cost/effective and that an alternate hearing conservation program is to be implemented.

Three commenters alleged that this regulation should only apply to MU cars built after January 1, 1981, and should not apply to emergency application of air brakes on multiple unit equipment. They claimed that although their older

cars exceed the 115dB(A) limit on emergency application of brakes, they have operated without crew complaints concerning cab noise for over 15 years.

FRA does not agree with this suggestion. The absence of complaints does not always correlate with conditions of non-excessive noise. Tolerance to noise is subjective with some people more sensitive than others. In addition, after years of excessive exposure, the onset of hearing loss may further minimize annoyance effects.

In addition to the technologies discussed above to reduce air brake valve noise, the efforts of a major air brake manufacturer concerning the PS–68–C air brake valve installed on multiple unit cars should be noted. This alternative, which was chosen among others because of ease of installation and maintenance, resulted in a substantial reduction in the noise level in comparison with the noise produced by the unmodified valve.

Three commenters objected to the fact that the proposed noise limits differed from the OSHA standard by the omission of the provision that "exposure to impulsive or impact noise should not exceed 140dB peak sound pressure level". They contended that this provision should have been inserted in lieu of the provision in the proposal stating that no exposure shall exceed 115dB(A).

FRA did not incorporate the 140dB impact/impulse noise limit because this type of noise is not normaily present in the locomotive cab. Impact or impulse noise is characterized by very brief (less than one second) excursions of sound pressure and is normally associated with industrial processes in which two objects collide or which use explosive means of production. Ear tolerance is directly related to its characteristic rise time, peak sound level, and peak duration. Continuous noise, on the other hand, is typically associated with the 115dB(A) limit which is derived from the 90dB(A)–5dB doubling rate criterion. To minimize confusion in this area, the final rule distinguishes continuous or intermittent noise from impulse/impact noise by defining continuous noise as to its rise time to peak intensity and duration at that level.

The concern about the 115dB(A) limitation may be somewhat alleviated by the accuracy limitations of the noise measuring instrumentation. For compliance purposes, readings with the Type 2 sound level meter and the personal noise dosimeter are considered to have an accuracy of ±2dB. FRA will use this measurement tolerance in our enforcement activities.

One commenter, RLEA, took exception to the proposed 90dB(A) 8-hour limit and suggested that 85dB(A) was more appropriate as the time-weighted average. Various research studies were quoted to support their contention that a lower standard was required to minimize noise level distraction from normal surveillance of wayside signals and locomotive controls, to ensure that communication between crew members is unimpaired, and to minimize the risk of hearing impairment. For example, the Swedish goal of no more than 78dB(A) inside the cab of their locomotives was mentioned by this commenter to support his contention.

In selecting the proposed noise exposure limits, FRA has attempted to strike a balance between that which is most desirable and that which is feasible. While the Swedish goal is commendable, it should also be realized that their operations rely more on the usage of generally quieter electric locomotives than rail operations in the United States. With regard to the risk of hearing loss, FRA recognizes that comparatively more crew members will be at lower risk at 85dB(A) than at 90dB(A). However, we also recognize the technical feasibility problems and the economic impact associated with an 85dB(A) requirement. Significant reduction in interior noise levels has been achieved in recent years by locomotive manufacturers by additional insulation installed in the cab roof and electrical cabinets, piping the brake valve exhaust outside the cab, and by horn location considerations. Further reductions may not be prudent due to significant increases in costs without a commensurate reduction in crew exposure.

In summary, FRA has determined that the 90dB(A)–8 hour noise exposure limit will provide adequate protection for the hearing, communication, and comfort of locomotive crews under presently accepted standards. More restrictive criteria will be considered if future research indicates that noise-induced fatigue at these levels adversely affects the safety of train operations.

Three commenters asserted that FRA should not have included the noise exposure of employees at 85dB(A) for 16 hours because under the Hours of Service Act, the maximum work day shift is only 12 hours. They recommended that the exposure limit only be extended to cover a 12-hour exposure of 87dB(A). Two other commenters believed that the exposure limit should, like the OSHA standard, cover only 8 hours.

FRA's intention in the proposal was to limit employee exposure to 90dB(A) as an eight-hour time-weighted average, with a 5dB doubling rate (the amount by which the exposure intensity may be increased when exposure time is decreased). As specified in the NPRM, this standard is generally accepted and is the General Industry Standard adopted by the Occupational Safety and Health Administration. (Although OSHA's present standard limits employee exposure to noise to 90dB(A) as an eight-hour time-weighted average with a 5dB doubling rate, a subsequent NPRM proposed to extend these limits to 85dB(A) for 16 hours. (42 FR 37773, October 24, 1974))

FRA has re-examined its approach in this area and now believes that neither the 8 or 16 hour limit is appropriate for the railroad operating environment. Rather, the 12-Hours of Service limitation should govern the extension of the 5dB doubling rate. Accordingly, the final rule has been modified by deleting the entry in the table limiting exposure at 16 hours to 85dB(A) and thus effectively specifies that only exposures above 87dB(A) be included when calculating an employee's noise dose.

A major locomotive manufacturer recommended that FRA specify test parameters and conditions for sound measurement to permit an objective assessment of compliance. A related comment in this area was the suggestion by one railroad that FRA relate measured noise levels to assigned duty cycles for comparison with the specified exposure limits.

FRA appreciates these commenters' concerns. A requirement has been added in the final rule on microphone location and orientation to minimize test result variability due to measurement procedures. At the same time, to best approximate the crew member's exposure due to operational variability, the final rule requires that all measurements for determination of compliance be performed under typical operating conditions of the locomotive under test.

FRA is aware that the crew's exposure dose is strongly influenced by operational characteristics such as duty cycles and the frequency of grade-crossings. It is for this reason that FRA, in cooperation with the AAR, has sponsored efforts by the National Bureau of Standards to develop a simplified stationary test procedure that will correlate crew exposure and noise level data for these effects. The stationary test procedure, if valid, would yield a value that could be correlated to the specified time-weighted average

limits. In addition, remedial action would be facilitated by the identification of high noise sources in the locomotive under test. If such a valid test procedure can be developed, FRA will incorporate it as an appendix to these regulations as a suggested method of compliance.

Finally, it was suggested by one commenter that language be added stating that a locomotive, at the time of its manufacture, be certified as complying with this section. Unlike the EPA standards and FRA Compliance Regulations (49 CFR 210), this section does not limit noise emissions. Rather, the limits relate to the noise level exposure of the locomotive occupants. Noise level exposure, in turn, is operational dependent and thus, influenced by duty cycles, and the particular characteristic of train operation. It is questionable whether, at this time, a manufacturer could certify, with acceptable accuracy, compliance with the prescribed noise exposure limits.

§ 229.123 Pilots, snowplows, end plates.

The final rule is the same as proposed except that the effective date is postponed until January 1, 1981. The effective date is delayed in order to provide time to equip locomotives that do not now have either a pilot, a snowplow, or an end plate.

RLEA requested that the rule include design standards for these components. FRA does not agree that this is necessary since locomotive suppliers and railroads are capable of designing and installing these items. There is no indication that presently equipped locomotives, which constitute the vast majority of the current fleet, have inadequate or structually unsound end plates, snowplows, or pilots.

Several other commenters who operate MU locomotives indicated that MUs are not equipped. They suggested that MU locomotives be excluded from the requirement. FRA disagrees because it believes a device to deflect objects on the track is an important safety device. The need for such a device is greater now than in the past because of sharply increased incidents of vandalism.

§ 229.125 Headlights.

The final rule has modified the proposed rule in two respects. It was noted by one commenter that there is no need for the second locomotive in a locomotive consist to have an operative headlight. An inoperative headlight on a locomotive that is not the lead locomotive is unrelated to safety and should not be a non-complying condition. FRA agrees with this analysis and has drafted the final rule to require only the lead locomotive to meet the headlight requirement.

A number of commenters noted that rule did not require alignment and focus of the headlight. FRA agrees and has included language from the prior rule that the light be arranged to illuminate a person ahead and in front of the locomotive at a given distance.

RLEA stated that the rule ought to require that new locomotives be built with sealed beam dual headlights on both ends. FRA does not believe that this detailed design requirement is necessary for safety, although FRA notes that most locomotives are currently so built. Safety is met so long as the locomotive has a headlight that meets the candela requirements of the rule.

Several railroad commenters disagreed with the required candela ratings included in the proposal. They did not, however, challenge the statement in the preamble to the NPRM that the candela levels selected correspond to the intensity level implicitly required under the prior rule. What these commenters apparently were saying is that the FRA could take exception under the prior rules to certain locomotives in their fleets, but FRA had not done so. FRA is not inclined to reduce the candela limits of the proposal since they reasonably reflect the prior rule. Nor should the use of a modern standard for light intensity be viewed as reflecting a change in FRA's enforcement approach. The waiver process can be utilized if a compliance problem arises for certain categories of locomotives.

§ 229.127 Cab lights.

The final rule reflects two changes to the proposed rule. First, the comma between the words "cab passageways" is deleted. This was a typographical error in the NPRM and this language in the final rule now identically tracks the language of § 230.233(b). Second, the word "excessively" has been added to the requirement in paragraph (c) of the NPRM that batteries may not gas and the entire paragraph is moved to § 229.43(b) of the final rule. Both changes were made as a result of comments from the AAR and several railroads. RLEA requested that the final rule include a new requirement that cab lights have an on/off switch accessible to the crew. FRA does believe that safety warrants adding this requirement. The final rule provides that the lights illuminating the control instruments shall shine only on those parts requiring illumination and shall not interfere with the crew's vision of the track and signals. The rule also provides that the light for reading timetables and train order shall have an on/off switch.

§ 229.129 Audible warning device.

The final rule reflects several changes from the NPRM. A number of commenters suggested that FRA delete the proposed language and retain the present standard. These commenters contended that there was a lack of data to support the proposed change and that present devices are loud enough. One commenter suggested that FRA study the current audible warning system in light of the strobe light NPRM.

FRA has sponsored extensive research to determine the most effective means of alerting motorists and pedestrians of approaching trains. The reports of the research focusing on audible warning devices indicate that primary reliance on these devices to warn motorists is not justified, and that to be loud enough to warn in all ordinary circumstances, the sound level would have to be increased greatly. The increased sound level would produce intolerable community and interior cab noise.

At the same time, FRA recognizes that there are circumstances where the use of the audible warning system plays an integral role in minimizing hazards due to approaching trains. It is for this reason that FRA has prescribed an objective measure of their performance by the specification of minimum decibel levels. The performance of an audible warning device may vary for a number of causes including not only its construction and its location, but also its general maintenance, problems involving the filtration of the air supply, and deterioration of the diaphragm. The present standard does not afford a convenient method for verifying that the audible warning device is "safe and suitable for service," other than the extremely subjective belief that it may not sound right. The most accurate method of determining the effectiveness is to rate its decibel output which can be readily verified with sound measurement equipment.

A major locomotive manufacturer claimed that their present three chime horn would not meet the proposed decibel levels. In particular, they were concerned that they could not meet the proposed 96dB(A) requirement at 100 feet from the rear of the locomotive and recommended that FRA specify 92dB(A) at this position.

FRA's intention in setting minimum decibel levels for audible warning devices was to prescribe a method for determining if these devices were being maintained and working properly. It was

not our intention to consign the well-maintained, standard three chime horn, to be out of compliance. FRA has further examined the measurement data relied upon when selecting the proposed levels, and a strong dependency on test measurement criteria such as weather conditions, topographical considerations, instrument tolerances, and reflecting objects has been revealed. In addition, measurements taken from the rear of the locomotive are heavily influenced by shadow effects of the hood structure, and line-of-sight limitations.

Accordingly, the final regulation has been revised to account for these effects by allowing a 4dB measurement tolerance. (Included in this tolerance is the generally accepted 2dB instrument tolerance.) It should also be recognized that a listener perceives a change of this magnitude as a relatively small difference in loudness.

A number of commenters claimed that the requirement that one chime of the audible warning device face in the direction of travel was redundant and should be deleted. Another commenter suggested that FRA require at least two chimes face in the forward direction.

FRA has re-examined its approach regarding the additional requirement on the chime direction of the warning device. The commenters' concerns regarding this issue have merit. FRA has specified a minimum decibel standard for the audible warning device to ensure that it is functioning properly. In addition, to account for reverse movement, we have required that this decibel level must be satisfied in the direction of travel of the locomotive. To impose a further requirement on chime direction is redundant and not integral to our stated goal. FRA has also concluded that it is not prudent to mandate a particular horn location or orientation for all locomotives. Accordingly, the chime direction requirement has been deleted in the final rule.

One commenter suggested that this section be revised to ensure that the occupants of the cab are protected from the noise of the audible warning device. In particular, it was suggested that FRA require that the device be located on the center line of the roof of the locomotive as far forward as possible and that a means be devised to deflect the sound away from the cab. The commenter's concerns over interior cab noise levels are addressed in § 229.121 by the specific occupational noise limits for cab noise exposure contained in that section.

A few commenters were concerned that FRA did not prescribe a measurement methodology to account for topography, speed, and other factors. The commenters' concern over the lack of a measurement methodolgy is partially addressed by the incorporation in the final rule of the measurement tolerance which will account for the cited variables. We believe this approach is preferable to imposing restrictive test criteria. However, to further minimize test variability, the requirements on sound level type and meter response characteristic have been expanded by a specification on microphone position when performing measurements.

Three commenters were concerned that their audible warning devices on MU cars would not meet the decibel or direction of at least one chime requirement. They suggested that these cars should be exempt from this section, or alternatively, that the effective date be adjusted to allow for waiver applications. They based this contention on the fact that their operations were unique due to grade crossing protection, speed restrictions, and travel through noise-sensitive areas.

FRA agrees that due to the diversity of the railroad industry, differing individual circumstances may justify waiver of the provisions of this rule. However, FRA does not believe, based on the information supplied, that there is a reasonable basis to generally exempt these operations from the rule itself. Rather, a petition for waiver of this provision is a more appropriate method by which to address the special problems of an individual carrier or particular operation. The effective date of the section has been delayed for a period of several months. This time period will allow for both a familiarization period as well as an opportunity to seek a waiver from the requirements if appropriate.

§ 229.131 Sanders.

No comments were received and no change has been made.

§ 220.141 Body structure, MU locomotives.

No comments. No change.

Civil Penalty Policy

RLEA was the only commenter that addressed the issue of civil penalties. RLEA stated that the minimum penalty for any violation should be higher than $250. FRA's discretion regarding the amount of civil penalties assessed is circumscribed by the provisions of the Locomotive Inspection Act, as amended. Section 9 of that Act (45 U.S.C. 34) provides that penalties for violations of rules, regulations or orders made under it shall be not less than $250 and not more than $2,500.

Appendix B to the final rule contains a revised penalty schedule that equates the amount of penalties to be assessed with the nature and degree of violations.

The purpose of Federal regulation of locomotives is to promote the safety of employees and the public. The achievement of that purpose is directly dependent upon compliance with the regulations. Therefore, the penalty levels for non-compliance should be structured in a manner that will effectively promote future compliance with the regulations. FRA believes that the revised penalty schedule will help to achieve that objective by refining the correlation between the degree of hazard presented by a violative condition and the amount of penalty assessed.

Appendix B of the final rule prescribes substantial penalties for violations of the rule. Where the degree of non-compliance could be objectively quantified, corresponding distinctions have been established in the penalty levels. In general, the highest penalities have been reserved for conditions that involve the greatest threat to the safety of employees and the public.

Appendix B provides for higher penalties where the circumstances indicate violations to be intentional. An intentional violation is the knowing and willful failure of a carrier to comply with the provisions of this final rule. The knowledge required for an intentional violation is knowledge of the facts constituting the violation. Knowledge of the regulations by a carrier is presumed by law. There are two instances that constitute *prima facie* evidence that a violation was knowing and willful; first, where there is evidence that a violation has been committed or has been allowed to continue by a carrier after an FRA inspector has provided the carrier with notification of deviation from the requirements of this rule; and second, where a carrier has made any repair to the locomotive component or appurtenance but has not brought that component or appurtenance into full compliance with this rule.

Under the penalty schedule, the locomotive (as opposed to individual deviations from this rule of individual components and appurtenance) remains the essential unit of violation. However, failure to perform, with respect to a particular locomotive, any of the inspections and tests required under Subpart B of this rule will be treated as a violation separate from, and in addition to, any other violative conditions detected on that locomotive. Penalties associated with individual

violations of this rule will be combined up to a total of $2500 if two or more violations are discovered with respect to a single locomotive because of the resulting increased safety risk.

The Act and this rule apply to every locomotive used on a carrier's line. Enforcement practices that are now followed with respect to the current rule will continue to be observed. For example, in the past FRA has construed "use" of a locomotive, within the meaning of the Act, to include the movement of a locomotive from a repair track or engine house to a ready track. That term has also been interpreted by the FRA to encompass train and yard service performed by locomotives.

FRA will closely monitor movements under the authority of § 229.9 to ensure that this section, which establishes a systemized procedure for the movement of non-complying locomotives, is not abused to the detriment of employee and public safety. A carrier will be subject to a civil penalty whenever a non-complying locomotive is used on its line unless the provisions of § 229.9 are met with respect to the movement.

Appendix B to this part supersedes Appendix A to 49 C.F.R. Part 209 to the extent the latter addresses violations of the Act. Appropriate revisions will be made to Part 209 following issuance of specific penalty schedules with respect to the balance of the rules presently subject to the regulatory revision project.

Economic Impact

FRA has determined that this document does not contain a significant regulation. Therefore, a Regulatory Analysis under Executive Order 12044 is not required (E.O. 12044, 43 FR 12661, March 24, 1978).

However, FRA did prepare an evaluation of the costs and benefits of the proposed regulation. FRA has revised that evaluation in light of the comments received and the changes made in the final rule, in accordance with DOT policies for evaluation of regulatory impacts (Regulatory Policies and Procedures, 44 FR 11034, February 26, 1979). A copy of the evaluation for the final rule has been placed in the public docket for this proceeding.

Environmental Impact

On March 16, 1979, the FRA published (44 FR 160662) revised procedures for insuring full consideration of the environmental impacts of FRA actions as required by the National Environmental Policy Act ("NEPA", 42 U.S.C. 4321 et seq.), the Department of Transportation Act ("DOT Act", 49 U.S.C. 1651 et seq.), other environmental statutes, executive orders, and DOT Order 5610.113.

These FRA procedures require that an "environmental assessment" be performed prior to all major FRA actions. The procedures contain a provision that enumerates seven criteria which, if met, demonstrate that a particular action is not a "major" action for environmental purposes. These criteria involve diverse factors, including environmental controversiality; the availability of adequate relocation housing; the possible inconsistency of the action with Federal, State, or local law; the possible adverse impact on natural, cultural, recreational, or scenic environments; the use of properties covered by Section 4(f) of the DOT Act; and the possible increase in traffic congestion.

This action meets the seven criteria that establish an action as a non-major action. Accordingly, the FRA has determined that the amendment of Part 230 and the adoption of Part 229, Railroad Locomotive Safety Standards, do not constitute a major action requiring an environmental assessment.

Small Business Impact

FRA has evaluated this document and determined that it does not have any significant or special impact on small business.

The Final Rule

In consideration of the foregoing, 49 CFR is amended by—

1. Revising Part 230 (49 CFR Part 230) to read as follows:

PART 230—LOCOMOTIVE INSPECTION

§ 230.0 Steam powered locomotives.

(a) No railroad may use a steam powered locomotive on its line unless that locomotive meets the requirements of 49 CFR Part 230, Subpart A (§§ 230.1–230.55) and Subpart B (§§ 230.101–230.162) as in effect on October 1, 1978.

(b) Any interested person may consult the October 1, 1978 revision of 49 CFR Parts 200–999 or obtain a copy of these regulations by contacting the Federal Railroad Administration, Office of Standards and Procedures, 400 7th St., S.W., Washington, D.C. 20590.

Subpart A—Boilers and Appurtenances

(Limited Applicability)

Subpart B—Steam Locomotives and Tenders

(Limited Applicability)

Authority: Secs. 1, 2, 5, 9, 36 Stat. 913, 914 (45 U.S.C. 22, 23, 28, 34); sec. 6 (e) and (f), 80 Stat. 939, 940 (49 U.S.C. 1655 (e) and (f)).

2. Adopting a new Part 229 (49 CFR Part 229) to read as follows:

PART 229—RAILROAD LOCOMOTIVE SAFETY STANDARDS

Subpart A—General

§ 229.1 Scope.
§ 229.3 Applicability.
§ 229.5 Definitions.
§ 229.7 Prohibited acts.
§ 229.9 Movement of non-complying locomotives.
§ 229.11 Locomotive identification.
§ 229.13 Control of locomotives.
§ 229.14 Non-MU control cab locomotives.
§ 229.15 Final report.
§ 229.17 Accident reports.
§ 229.19 Prior waivers.

Subpart B—Inspections and Tests

§ 229.21 Daily inspection.
§ 229.23 Periodic inspection: General.
§ 229.25 Tests: Every periodic inspection.
§ 229.27 Annual tests.
§ 229.29 Biennial tests.
§ 229.31 Main reservoir tests.
§ 229.33 Out-of-use credit.

Subpart C—Safety Requirements

General Requirements

§ 229.41 Protection against personal injury.
§ 229.43 Exhaust and battery gases.
§ 229.45 General condition.

Brake System

§ 229.46 Brakes: General.
§ 229.47 Emergency brake valve.
§ 229.49 Main reservoir system.
§ 229.51 Aluminum main reservoirs.
§ 229.53 Brake gauges.
§ 229.55 Piston travel.
§ 229.57 Foundation brake gear.
§ 229.59 Leakage.

Draft System

§ 229.61 Draft system.

Suspension System

§ 229.63 Lateral motion.
§ 229.64 Plain bearings.
§ 229.65 Spring rigging.
§ 229.67 Trucks.
§ 229.69 Side bearings.
§ 229.71 Clearance above top of rail.
§ 229.73 Wheel sets.
§ 229.75 Wheel and tire defects.

Electrical System

§ 229.77 Current collectors.
§ 229.79 Third rail shoes.
§ 229.81 Emergency pole; shoe insulation.
§ 229.83 Insulation or grounding of metal parts.
§ 229.85 Doors and cover plates marked "Danger".
§ 229.87 Hand-operated switches.
§ 229.89 Jumpers; cable connections.
§ 229.91 Motors and generators.

Internal Combustion Equipment

§ 229.93 Safety cut-off device.
§ 229.95 Venting.

§ 229.97 Grounding fuel tanks.
§ 229.99 Safety hangers.
§ 229.101 Engines.

Steam Generators

§ 229.103 Safe working pressure; factor of safety.
§ 229.105 Steam generator number.
§ 229.107 Pressure gauge.
§ 229.109 Safety valves.
§ 229.111 Water-flow indicator.
§ 229.113 Warning notice.

Cabs and Cab Equipment

§ 229.115 Slip/slide alarms.
§ 229.117 Speed indicators.
§ 229.119 Cabs, floors, and passageways.
§ 229.121 Locomotive cab noise.
§ 229.123 Pilots, snowplows, end plates.
§ 229.125 Headlights.
§ 229.127 Cab lights.
§ 229.129 Audible warning device.
§ 229.131 Sanders.

Subpart D—Design Requirements

§ 229.141 Body structure, MU locomotives.
Appendix A—Form FRA 6180.49A.
Appendix B—Schedule of Civil Penalties.
Appendix C—FRA Locomotive Standards Defect Code.

Authority: Secs. 1, 2, 5, 9, 36 Stat. 913, 914 (45 U.S.C. 22, 23, 28, 34); sec. 6(e) and (f), 80 Stat. 939, 940 (49 U.S.C. 1655(e) and (f)).

Subpart A—General

§ 229.1 Scope.

This part prescribes minimum Federal safety standards for all locomotives except those propelled by steam power.

§ 229.3 Applicability.

This part applies to all common carriers by railroad as defined in the Locomotive Inspection Act (45 U.S.C. § 22).

§ 229.5 Definitions.

As used in this part—

(a) "Break" means a fracture resulting in complete separation into parts.

(b) "Cab" means that portion of the superstructure designed to be occupied by the crew operating the locomotive.

(c) "Carrier" means a common carrier by railroad subject to the Locomotive Inspection Act (45 U.S.C. § 22).

(d) "Control cab locomotive" means a locomotive without propelling motors but with one or more control stands.

(e) "Crack" means a fracture without complete separation into parts, except that castings with shrinkage cracks or hot tears that do not significantly diminish the strength of the member are not considered to be cracked.

(f) "Dead locomotive" means—

(1) A locomotive other than a control cab locomotive that does not have any traction device supplying tractive power; or

(2) A control cab locomotive that has a locked and unoccupied cab.

(g) "High voltage" means an electrical potential of more than 150 volts.

(h) "Lite locomotive" means a locomotive or a consist of locomotives not attached to any piece of equipment or attached only to a caboose.

(i) "Locomotive" means a piece of on-track equipment other than hi-rail, specialized maintenance, or other similar equipment—

(1) With one or more propelling motors designed for moving other equipment;

(2) With one or more propelling motors designed to carry freight or passenger traffic or both; or

(3) Without propelling motors but with one or more control stands.

(j) "MU locomotive" means a multiple operated electric locomotive described in paragraph (i)(2) or (3) of this section.

(k) "Powered axle" is an axle equipped with a traction device.

(l) "Serious injury" means an injury that results in the amputation of any appendage, the loss of sight in an eye, the fracture of a bone, or the confinement in a hospital for a period of more than 24 consecutive hours.

§ 229.7 Prohibited acts.

(a) The Locomotive Inspection Act (45 U.S.C. §§ 22–34) makes it unlawful for any carrier to use or permit to be used on its line any locomotive unless the entire locomotive and its appurtenances—

(1) Are in proper condition and safe to operate in the service to which they are put, without unnecessary peril to life or limb; and

(2) Have been inspected and tested as required by this part.

(b) A carrier is subject to a penalty, as provided in Appendix B, if it fails to comply with any provision of this part or of the Locomotive Inspection Act.

§ 229.9 Movement of non-complying locomotives.

(a) Except as provided in paragraphs (b) and (c), a locomotive with one or more conditions not in compliance with this part may be moved only as a lite locomotive or a dead locomotive after the carrier has complied with the following:

(1) A qualified person shall determine—

(i) That it is safe to move the locomotive; and

(ii) The maximum speed and other restrictions necessary for safely conducting the movement;

(2)(i) The engineer in charge of the movement of the locomotive shall be notified in writing and inform all other crew members in the cab of the presence of the non-complying locomotive and the maximum speed and other restrictions determined under paragraph (a)(1)(ii) of this section.

(ii) A copy of the tag described in paragraph (a)(3) of this section may be used to provide the notification required by paragraph (a)(2)(i) of this section.

(3) A tag bearing the words "non-complying locomotive" and containing the following information, shall be securely attached to the control stand on each MU or control cab locomotive and to the isolation switch or near the engine start switch on every other type of locomotive—

(i) The locomotive number;

(ii) The name of the inspecting carrier;

(iii) The inspection location and date;

(iv) The nature of each defect;

(v) Movement restrictions, if any;

(vi) The destination; and

(vii) The signature of the person making the determinations required by this paragraph.

(b) A locomotive that develops a non-complying condition enroute may continue to utilize its propelling motors, if the requirements of paragraph (a) are otherwise fully met, until the earlier of—

(1) The next calendar day inspection, or

(2) The nearest forward point where the repairs necessary to bring it into compliance can be made.

(c) A non-complying locomotive may be moved lite or dead within a yard, at speeds not in excess of 10 miles per hour, without meeting the requirements of paragraph (a) of this section if the movement is solely for the purpose of repair. The carrier is responsible to insure that the movement may be safely made.

(d) A dead locomotive may not continue in use following a calendar day inspection as a controlling locomotive or at the head of a train or locomotive consist.

(e) A locomotive does not cease to be a locomotive because its propelling motor or motors are inoperative or because its control jumper cables are not connected.

(f) Nothing in this section authorizes the movement of a locomotive subject to a Special Notice for Repair unless the movement is made in accordance with the restrictions contained in the Special Notice.

§ 229.11 Locomotive identification.

(a) The letter "F" shall be legibly shown on each side of every locomotive near the end which for identification purposes will be known as the front end.

(b) The locomotive number shall be displayed in clearly legible numbers on each side of each locomotive.

§ 229.13 Control of locomotives.

Except when a locomotive is moved in accordance with § 229.9, whenever two or more locomotives are coupled in remote or multiple control, the propulsion system, the sanders, and the power brake system of each locomotive shall respond to control from the cab of the controlling locomotive. If a dynamic brake or regenerative brake system is in use, that portion of the system in use shall respond to control from the cab of the controlling locomotive.

§ 229.14 Non-MU control cab locomotives.

On each non-MU control cab locomotive, only those components added to the passenger car that enable it to serve as a lead locomotive, control the locomotive actually providing tractive power, and otherwise control the movement of the train, are subject to this part.

§ 229.15 Final report.

(a) When a locomotive is permanently retired from use, the Form FRA F 6180–49A on the locomotive at that time shall be removed and filed within 30 days with the Federal Railroad Administration, RRS–25, Washington, D.C. 20590. Each form filed shall contain the following:

(1) The words "locomotive will not again be used by this company."

(2) The date and place the locomotive is retired from use; and

(3) A statement of the disposition of the locomotive.

(b) When a locomotive steam generator is permanently retired from use the Form FRA F 6180–49A on the locomotive shall contain the following:

(1) The words "steam generator will not again be used by this company."

(2) The date and place the steam generator is retired from use; and

(3) A statement of the disposition of the steam generator.

§ 229.17 Accident reports.

(a) In the case of an accident due to a failure from any cause of a locomotive or any part or appurtenance of a locomotive, or a person coming in contact with an electrically energized part or appurtenance, that results in serious injury or death of one or more persons, the carrier operating the locomotive shall immediately report the accident by toll free telephone, Area Code 800–424–0201. The report shall state the nature of the accident, number of persons killed or seriously injured, the place at which it occurred, the location at which the locomotive or the affected parts may be inspected by the FRA, and the name, title and phone number of the person making the call. The locomotive or the part or parts affected by the accident shall be preserved intact by the carrier until after the FRA inspection.

(b) Written confirmation of the oral report required by paragraph (a) of this section shall be immediately mailed to the Federal Railroad Administration, RRS–25, Washington, D.C. 20590, and contain a detailed description of the accident, including to the extent known, the causes and the number of persons killed and injured. The written report required by this paragraph is in addition to the reporting requirements of 49 CFR Part 225.

§ 229.19 Prior waivers.

All waivers of every form and type from any requirement of any order or regulation implementing the Locomotive Inspection Act, applicable to one or more locomotives except those propelled by steam power, shall lapse on August 31, 1980, unless a copy of the grant of waiver is filed prior to that date with the Office of Safety (RRS–23), Federal Railroad Administration, Washington, D.C. 20590.

Subpart B—Inspections and Tests

§ 229.21 Daily inspection.

(a) Except for MU locomotives, each locomotive in use shall be inspected at least once during each calendar day. A written report of the inspection shall be made. This report shall contain the name of the carrier; the initials and number of the locomotive; the place, date and time of the inspection; a description of the non-complying conditions disclosed by the inspection; and the signature of the employee making the inspection. Except as provided in § 229.9, any conditions that constitute non-compliance with any requirement of this part shall be repaired before the locomotive is used. A notation shall be made on the report indicating the nature of the repairs that have been made. The person making the repairs shall sign the report. The report shall be filed and retained for at least one year in the office of the carrier at the terminal at which the locomotive is cared for. A record shall be maintained on each locomotive showing the place, date and time of the previous inspection.

(b) Each MU locomotive in use shall be inspected at least once during each calendar day and a written report of the inspection shall be made. This report may be part of a single master report covering an entire group of MU's. If any non-complying conditions are found, a separate, individual report shall be made containing the name of the carrier; the initials and number of the locomotive; the place, date, and time of the inspection; the non-complying conditions found; and the signature of the inspector. Except as provided in § 229.9, any conditions that constitute non-compliance with any requirement of this part shall be repaired before the locomotive is used. A notation shall be made on the report indicating the nature of the repairs that have been made. The person making the repairs shall sign the report. The reports shall be filed in the office of the carrier at the place where the inspection is made or at one central location and retained for at least one year.

(c) Each carrier shall designate qualified persons to make the inspections required by this section.

§ 229.23 Periodic inspection: General.

(a) Each locomotive and steam generator shall be inspected at each periodic inspection to determine whether it complies with this part. Except as provided in § 229.9, all non-complying conditions shall be repaired before the locomotive or the steam generator is used. Except as provided in § 229.33, the interval between any two periodic inspections may not exceed 92 days. Periodic inspections shall only be made where adequate facilities are available. At each periodic inspection, a locomotive shall be positioned so that a person may safely inspect the entire underneath portion of the locomotive.

(b) The periodic inspection of the steam generator may be postponed indefinitely if the water suction pipe to the water pump and the leads to the main switch (steam generator switch) are disconnected, and the train line shut-off-valve is wired closed or a blind gasket applied. However, the steam generator shall be so inspected before it is returned to use.

(c) After April 30, 1980, each new locomotive shall receive an initial periodic inspection before it is used. Except as provided in § 229.33, before July 1, 1980, each locomotive in use on or before April 30, 1980, shall receive an initial periodic inspection. At the initial periodic inspection, the date and place of the last tests performed that are the equivalent of the tests required by §§ 229.27, 229.29, and 229.31 shall be entered on Form FRA F 6180–49A. These dates shall determine when the tests first become due under §§229.27, 229.29, and 229.31. Out of use credit may be carried over from Form FRA F 6180–49 and entered on Form FRA F 6180–49A.

(d) Each periodic inspection shall be recorded on Form FRA F 6180–49A. The form shall be signed by the person conducting the inspection and certified by that person's supervisor that the

work was done. The form shall be displayed under a transparent cover in a conspicuous place in the cab of each locomotive.

(e) At the first periodic inspection in each calendar year the carrier shall remove from each locomotive the Form FRA F 6180–49A covering the previous calendar year. If a locomotive does not receive its first periodic inspection in a calendar year before April 2nd because it is out of use, the form shall be promptly replaced. The FRA F 6180–49A form covering the preceding year for each locomotive, in or out of use, shall be certified by the railroad official responsible for the locomotive and filed not later than May 1 of each year with the Federal Railroad Administration, RRS–25, Washington, D.C. 20590. The date and place of the last periodic inspection and the date and place of the last tests performed under §§ 229.27, 229.29, and 229.31 shall be transferred to the replacement form FRA F 6180–49A.

(f) The mechanical officer of each railroad who is in charge of a locomotive shall maintain in his office a secondary record of the information reported on Form FRA F 6180–49A under this part. The secondary record shall be retained for at least two years.

§ 229.25 Tests: Every periodic inspection.

Each periodic inspection shall include the following:

(a) All gauges used by the engineer for braking the train or locomotive, except load meters used in conjunction with an auxiliary brake system, shall be tested by comparison with a dead-weight tester or a test gauge designed for this purpose.

(b) All electrical devices and visible insulation shall be inspected.

(c) All cable connections between locomotives and jumpers that are designed to carry 600 volts or more shall be thoroughly cleaned, inspected, and tested for continuity.

(d) Each steam generator that is not isolated as prescribed in § 229.23(b) shall be inspected and tested as follows:

(1) All automatic controls, alarms and protective devices shall be inspected and tested.

(2) Steam pressure gauges shall be tested by comparison with a dead-weight tester or a test gauge designed for this purpose. The siphons to the steam gauges shall be removed and their connections examined to determine that they are open.

(3) Safety valves shall be set and tested under steam after the steam pressure gauge is tested.

§ 229.27 Annual tests.

Each locomotive shall be subjected to the tests and inspections included in paragraphs (b) and (c) of this section, and each non-MU locomotive shall also be subjected to the tests and inspections included in paragraph (a) of this section, at intervals that do not exceed 368 calendar days:

(a)(1) The filtering devices or dirt collectors located in the main reservoir supply line to the air brake system shall be cleaned, repaired, or replaced.

(2) Brake cylinder relay valve portions, main reservoir safety valves, brake pipe vent valve portions, feed and reducing valve portions in the air brake system (including related dirt collectors and filters) shall be cleaned, repaired, and tested.

(3) The date and place of the cleaning, repairing, and testing shall be recorded on Form FRA F 6180–49A and the person performing the work and that person's supervisor shall sign the form. A record of the parts of the air brake system that are cleaned, repaired, and tested shall be kept in the carrier's files or in the cab of the locomotive.

(4) At its option, a carrier may fragment the work required by this paragraph. In that event, a separate air record shall be maintained under a transparent cover in the cab. The air record shall include the locomotive number, a list of the air brake components, and the date and place of the last inspection and test of each component. The signature of the person performing the work and the signature of that person's supervisor shall be included for each component. A duplicate record shall be maintained in the carrier's files.

(b) Load meters shall be tested. Errors of less than five percent do not have to be corrected. The date and place of the test shall be recorded on Form FRA F 6180–49A and the person conducting the test and that person's supervisor shall sign the form.

(c) Each steam generator that is not isolated as prescribed in § 229.23(b), shall be subjected to a hydrostatic pressure at least 25 percent above the working pressure and the visual return water-flow indicator shall be removed and inspected.

§ 229.29 Biennial tests.

(a) Except for the valves and valve portions on non-MU locomotives that are cleaned, repaired, and tested as prescribed in § 229.27(a), all valves, valve portions, MU locomotive brake cylinders and electric-pneumatic master controllers in the air brake system (including related dirt collectors and filters) shall be cleaned, repaired, and tested at intervals that do not exceed 736 calendar days. The date and place of the cleaning, repairing, and testing shall be recorded on Form FRA F 6180–49A, and the person performing the work and that person's supervisor shall sign the form. A record of the parts of the air brake system that are cleaned, repaired, and tested shall be kept in the carrier's files or in the cab of the locomotive.

(b) At its option, a carrier may fragment the work required by this section. In that event, a separate air record shall be maintained under a transparent cover in the cab. The air record shall include the locomotive number, a list of the air brake components, and the date and place of the inspection and test of each component. The signature of the person performing the work and the signature of that person's supervisor shall be included for each component. A duplicate record shall be maintained in the carrier's files.

§ 229.31 Main reservoir tests.

(a) Except as provided in paragraph (c) of this section, before it is put in service and at intervals that do not exceed 736 calendar days, each main reservoir other than an aluminum reservoir shall be subjected to a hydrostatic pressure of at least 25 percent more than the maximum working pressure fixed by the chief mechanical officer. The test date, place, and pressure shall be recorded on Form FRA F 6180–49A, and the person performing the test and that person's supervisor shall sign the form.

(b) Except as provided in paragraph (c) of this section, each main reservoir other than an aluminum reservoir shall be hammer tested over its entire surface while the reservoir is empty at intervals that do not exceed 736 calendar days. The test date and place shall be recorded on Form FRA F 6180–49A, and the person performing the test and that person's supervisor shall sign the form.

(c) Each welded main reservoir originally constructed to withstand at least five times the maximum working pressure fixed by the chief mechanical officer may be drilled over its entire surface with telltale holes that are three-sixteenths of an inch in diameter. The holes shall be spaced not more than 12 inches apart, measured both longitudinally and circumferentially, and drilled from the outer surface to an extreme depth determined by the formula—

$$D=(.6PR/(S-0.6P))$$

where D=extreme depth of telltale holes in inches but in no case less than

one-sixteenth inch; P=certified working pressure in pounds per square inch; S=one-fifth of the minimum specified tensile strength of the material in pounds per square inch; and R=inside radius of the reservoir in inches. One row of holes shall be drilled lengthwise of the reservoir on a line intersecting the drain opening. A reservoir so drilled does not have to meet the requirements of paragraphs (a) and (b) of this section, except the requirement for a hydrostatic test before it is placed in use. Whenever any such telltale hole shall have penetrated the interior of any reservoir, the reservoir shall be permanently withdrawn from service. A reservoir now in use may be drilled in lieu of the tests provided for by paragraphs (a) and (b) of this section, but it shall receive a hydrostatic test before it is returned to use.

(d) Each aluminum main reservoir before being placed in use and at intervals that do not exceed 736 calendar days thereafter, shall be—

(1) Cleaned and given a thorough visual inspection of all internal and external surfaces for evidence of defects or deterioration; and

(2) Subjected to a hydrostatic pressure at least twice the maximum working pressure fixed by the chief mechanical officer, but not less than 250 p.s.i. The test date, place, and pressure shall be recorded on Form FRA F 6180–49A, and the person conducting the test and that person's supervisor shall sign the form.

§ 229.33 Out-of-use credit.

When a locomotive is out of use for 30 or more consecutive days or is out of use when it is due for any test or inspection required by §§ 229.23, 229.25, 229.27, 229.29, or 229.31, an out-of-use notation showing the number of out-of-use days shall be made on an inspection line on Form FRA F 6180–49A. A supervisory employee of the carrier who is responsible for the locomotive shall attest to the notation. If the locomotive is out of use for one or more periods of at least 30 consecutive days each, the interval prescribed for any test or inspection under this part may be extended by the number of days in each period the locomotive is out of use since the last test or inspection in question. A movement made in accordance with § 229.9 is not a use for purposes of determining the period of the out-of-use credit.

Subpart C—Safety Requirements

General Requirements

§ 229.41 Protection against personal injury.

Fan openings, exposed gears and pinions, exposed moving parts of mechanisms, pipes carrying hot gases and high-voltage equipment, switches, circuit breakers, contactors, relays, grid resistors, and fuses shall be in non-hazardous locations or equipped with guards to prevent personal injury.

§ 229.43 Exhaust and battery gases.

(a) Products of combustion shall be released entirely outside the cab and other compartments. Exhaust stacks shall be of sufficient height or other means provided to prevent entry of products of combustion into the cab or other compartments under usual operating conditions.

(b) Battery containers shall be vented and batteries kept from gassing excessively.

§ 229.45 General condition.

All systems and components on a locomotive shall be free of conditions that endanger the safety of the crew, locomotive or train. These conditions include: insecure attachment of components, including third rail shoes or beams, traction motors and motor gear cases, and fuel tanks; fuel, oil, water, steam, and other leaks and accumulations of oil on electrical equipment that create a personal injury hazard; improper functioning of components, including slack adjusters, pantograph operating cylinders, circuit breakers, contactors, relays, switches, and fuses; and cracks, breaks, excessive wear and other structural infirmities of components, including quill drives, axles, gears, pinions, pantograph shoes and horns, third rail beams, traction motor gear cases, and fuel tanks.

Brake System

§ 229.46 Brakes: General.

The carrier shall know before each trip that the locomotive brakes and devices for regulating all pressures, including but not limited to the automatic and independent brake valves, operate as intended and that the water and oil have been drained from the air brake system.

§ 229.47 Emergency brake value.

(a) Except for locomotives with cabs designed for occupancy by only one person, each road locomotive shall be equipped with a brake pipe valve that is accessible to a member of the crew, other than the engineer, from that crew member's position in the cab. On car body type locomotives, a brake pipe valve shall be attached to the wall adjacent to each end exit door. The words "Emergency Brake Valve" shall be legibly stenciled or marked near each brake pipe valve or shall be shown on an adjacent badge plate.

(b) MU and control cab locomotives operated in road service shall be equipped with an emergency brake valve that is accessible to another crew member in the passenger compartment or vestibule. The words "Emergency Brake Valve" shall be legibly stenciled or marked near each valve or shall be shown on an adjacent badge plate.

§ 229.49 Main reservoir system.

(a)(1) The main reservoir system of each locomotive shall be equipped with at least one safety valve that shall prevent an accumulation of pressure of more than 15 pounds per square inch above the maximum working air pressure fixed by the chief mechanical officer of the carrier operating the locomotive.

(2) Except for non-equipped MU locomotives built prior to January 1, 1981, each locomotive that has a pneumatically actuated system of power controls shall be equipped with a separate reservoir of air under pressure to be used for operating those power controls. The reservoir shall be provided with means to automatically prevent the loss of pressure in the event of a failure of main air pressure, have storage capacity for not less than three complete operating cycles of control equipment and be located where it is not exposed to damage.

(b) a governor shall be provided that stops and starts or unloads and loads the air compressor within 5 pounds per square inch above or below the maximum working air pressure fixed by the carrier.

(c) Each compressor governor used in connection with the automatic air brake system shall be adjusted so that the compressor will start when the main reservoir pressure is not less than 15 pounds per square inch above the maximum brake pipe pressure fixed by the carrier and will not stop the compressor until the reservoir pressure has increased at least 10 pounds.

§ 229.51 Aluminum main reservoirs.

(a) Aluminum main reservoirs used on locomotives shall be designed and fabricated as follows:

(1) The heads and shell shall be made of Aluminum Association Alloy No. 5083–0, produced in accordance with American Society of Mechnical Engineers (ASME) Specification SB–209,

as defined in the "ASME Boiler and Pressure Vessel Code" (1971 edition), Section II, Part B, page 123, with a minimum tensile strength of 40,000 p.s.i. (40 k.s.i.).

(2) Each aluminum main reservoir shall be designed and fabricated in accordance with the "ASME Boiler and Pressure Vessel Code," Section VIII, Division I (1971 edition), except as otherwise provided in this part.

(3) An aluminum main reservoir shall be constructed to withstand at least five times its maximum working pressure or 800 p.s.i., whichever is greater.

(4) Each aluminum main reservoir shall have at least two inspection openings to permit complete circumferential visual observation of the interior surface. On reservoirs less than 18 inches in diameter, the size of each inspection opening shall be at least that of 1½-inch threaded iron pipe, and on reservoirs 18 or more inches in diameter, the size of each opening shall be at least that of 2-inch threaded iron pipe.

(b) The following publications, which contain the industry standards incorporated by reference in paragraph (a) of this section, may be obtained from the publishers and are also on file in the Office of Safety of the Federal Railroad Administration, Washington, D.C. 20590. Sections II and VIII of the "ASME Boiler and Pressure Vessel Code" (1971 edition) are published by the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, New York 10017.

§ 229.53 Brake gauges.

All gauges used by the engineer for braking the train or locomotive shall be located so that they may be conveniently read from the engineer's usual position in the cab. An air gauge may not be more than three pounds per square inch in error.

§ 229.55 Piston travel.

(a) Brake cylinder piston travel shall be sufficient to provide brake shoe clearance when the brakes are released.

(b) When the brakes are applied on a standing locomotive, the brake cylinder piston travel may not exceed 1½ inches less than the total possible piston travel. The total possible piston travel for each locomotive shall be entered on Form FRA F 6180–49A.

(c) The minimum brake cylinder pressure shall be 30 pounds per square inch.

§ 229.57 Foundation brake gear.

A lever, rod, brake beam, hanger, or pin may not be worn through more than 30 percent of its cross-sectional area, cracked, broken, or missing. All pins shall be secured in place with cotters, split keys, or nuts. Brake shoes shall be fastened with a brake shoe key and aligned in relation to the wheel to prevent localized thermal stress in the edge of the rim or the flange.

§ 229.59 Leakage.

(a) Leakage from the main air reservoir and related piping may not exceed an average of 3 pounds per square inch per minute for 3 minutes after the pressure has been reduced to 60 percent of the maximum pressure.

(b) Brake pipe leakage may not exceed 5 pounds per square inch per minute.

(c) With a full service application at maximum brake pipe pressure and with communication to the brake cylinders closed, the brakes shall remain applied at least 5 minutes.

(d) Leakage from control air reservoir, related piping, and pneumatically operated controls may not exceed an average of 3 pounds per square inch per minute for 3 minutes.

Draft System

§ 229.61 Draft system.

(a) A coupler may not have any of the following conditions:

(1) A distance between the guard arm and the knuckle nose of more than 5⅛ inches on standard type couplers (MCB contour 1904) or more than 5⁹⁄₁₆ inches on D&E couplers.

(2) A crack or break in the side wall or pin bearing bosses outside of the shaded areas shown in Figure 1 or in the pulling face of the knuckle.

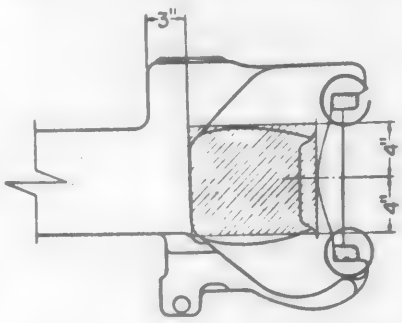

Figure 1

(3) A coupler assembly without anti-creep protection.

(4) Free slack in the coupler or drawbar not absorbed by friction devices or draft gears that exceeds one-half inches.

(5) A broken or cracked coupler carrier.

(6) A broken or cracked yoke.

(7) A broken draft gear.

(b) A device shall be provided under the lower end of all drawbar pins and articulated connection pins to prevent the pin from falling out of place in case of breakage.

Suspension System

§ 229.63 Lateral motion.

(a) Except as provided in paragraph (b), the total uncontrolled lateral motion between the hubs of the wheels and boxes, between boxes and pedestals or both, on any pair of wheels may not exceed 1 inch on non-powered axles and friction bearing powered axles, or ¾ inch on all other powered axles.

(b) The total uncontrolled lateral motion may not exceed 1¼ inches on the center axle of three-axle trucks.

§ 229.64 Plain bearings.

A plain bearing box shall contain visible free oil and may not be cracked to the extent that it will leak oil.

§ 229.65 Spring rigging.

(a) Protective construction or safety hangers shall be provided to prevent spring planks, spring seats or bolsters from dropping to track structure in event of a hanger or spring failure.

(b) An elliptical spring may not have its top (long) leaf broken or any other three leaves broken, except when that spring is part of a nest of three or more springs and none of the other springs in the nest has its top leaf or any other three leaves broken. An outer coil spring or saddle may not be broken. An equalizer, hanger, bolt, gib, or pin may not be cracked or broken. A coil spring may not be fully compressed when the locomotive is at rest.

(c) A shock absorber may not be broken or leaking clearly formed droplets of oil or other fluid.

§ 229.67 Trucks.

(a) The male center plate shall extend into the female center plate at least ¾ inch. On trucks constructed to transmit tractive effort through the center plate or center pin, the male center plate shall extend into the female center plate at least 1½ inches. Maximum lost motion in a center plate assemblage may not exceed ½ inch.

(b) Each locomotive shall have a device or securing arrangement to prevent the truck and locomotive body from separating in case of derailment.

(c) A truck may not have a loose tie bar or a cracked or broken center casting, motor suspension lug, equalizer, hanger, gib or pin. A truck frame may not be broken or have a crack in a stress area that may affect its structural integrity.

§ 229.69 Side bearings.

(a) Friction side bearings with springs designed to carry weight may not have more than 25 percent of the springs in any one nest broken.

(b) Friction side bearings may not be run in contact unless designed to carry weight. Maximum clearance of side bearings may not exceed one-fourth inch on each side or a total of one-half inch on both sides, except where more than two side bearings are used under the same rigid superstructure. The clearance on one pair of side bearings under the same rigid superstructure shall not exceed one-fourth inch on each side or a total of one-half inch on both sides; the other side bearings under the same rigid superstructure may have one-half inch clearance on each side or a total of 1 inch on both sides. These clearances apply where the spread of the side bearings is 50 inches or less; where the spread is greater, the side bearing clearance may only be increased proportionately.

§ 229.71 Clearance above top of rail.

No part or appliance of a locomotive except the wheels, flexible nonmetallic sand pipe extension tips, and trip cock arms may be less than 2½ inches above the top of rail.

§ 229.73 Wheel sets.

(a) The variation in the circumference of wheels on the same axle may not exceed ¼ inch (two tape sizes) when applied or turned.

(b) The maximum variation in the diameter between any two wheel sets in a three-powered-axle truck may not exceed ¾ inch, except that when shims are used at the journal box springs to compensate for wheel diameter variation, the maximum variation may not exceed 1¼ inch. The maximum variation in the diameter between any two wheel sets on different trucks on a locomotive that has three-powered-axle trucks may now exceed 1¼ inch. The diameter of a wheel set is the average diameter of the two wheels on an axle.

(c) On standard gauge locomotives, the distance between the inside gauge of the flanges on non-wide flange wheels may not be less than 53 inches or more than 53½ inches. The distance between the inside gauge of the flanges on wide flange wheels may not be less than 53 inches or more than 53¼ inches.

(d) The distance back to back of flanges of wheels mounted on the same axle shall not vary more than ¼ inch.

§ 229.75 Wheels and tire defects.

Wheels and tires may not have any of the following conditions:

(a) A single flat spot that is 2½ inches or more in length, or two adjoining spots that are each two or more inches in length.

(b) A gouge or chip in the flange that is more than 1½ inches in length and ½ inch in width.

(c) A broken rim, if the tread, measured from the flange at a point five-eighths inch above the tread, is less than 3¾ inches in width.

(d) A shelled-out spot 2½ inches or more in length, or two adjoining spots that are each two or more inches in length.

(e) A seam running lengthwise that is within 3¾ inches of the flange.

(f) A flange worn to a ⅞ inch thickness or less, gauged at a point ⅝ inch above the tread.

(g) A tread worn hollow 5/16 inch or more on a locomotive in road service or ⅜ inch or more on a locomotive in switching service.

(h) A flange height of 1½ inches or more measured from tread to the top of the flange.

(i) Tires less than 1½ inches thick.

(j) Rims less than 1 inch thick on a locomotive in road service or less than ¾ inch on a locomotive in yard service.

(k) A crack or break in the flange, tread, rim, plate, or hub.

(l) A loose wheel or tire.

(m) Fusion welding may not be used on tires or steel wheels of locomotives, except for the repair of flat spots and worn flanges on locomotives used exclusively in yard service. A wheel that has been welded is a welded wheel for the life of the wheel.

Electrical System

§ 229.77 Current collectors.

(a) Pantographs shall be so arranged that they can be operated from the engineer's normal position in the cab. Pantographs that automatically rise when released shall have an automatic locking device to secure them in the down position.

(b) Each pantograph operating on an overhead trolley wire shall have a device for locking and grounding it in the lowest position, that can be applied and released only from a position where the operator has a clear view of the pantograph and roof without mounting the roof.

§ 229.79 Third rail shoes.

When locomotives are equipped with both third rail and overhead collectors, third-rail shoes shall be deenergized while in yards and at stations when current collection is exclusively from the overhead conductor.

§ 229.81 Emergency pole; shoe insulation.

(a) Each locomotive equipped with a pantograph operating on an overhead trolley wire shall have an emergency pole suitable for operating the pantograph. Unless the entire pole can be safely handled, the part of the pole which can be safely handled shall be marked to so indicate. This pole shall be protected from moisture when not in use.

(b) Each locomotive equipped with third-rail shoes shall have a device for insulating the current collecting apparatus from the third rail.

§ 229.83 Insulation or grounding of metal parts.

All unguarded noncurrent-carrying metal parts subject to becoming charged shall be grounded or thoroughly insulated.

§ 229.85 Doors and cover plates marked "Danger".

All doors and cover plates guarding high voltage equipment shall be marked "Danger—High Voltage" or with the word "Danger" and the normal voltage carried by the parts so protected.

§ 229.87 Hand-operated switches.

All hand-operated switches carrying currents with a potential of more than 150 volts that may be operated while under load shall be covered and shall be operative from the outside of the cover. Means shall be provided to show whether the switches are open or closed. Switches that should not be operated while under load shall be legibly marked with the words "must not be operated under load" and the voltage carried.

§ 229.89 Jumpers; cable connections.

(a) Jumpers and cable connections between locomotives shall be so located and guarded to provide sufficient vertical clearance. They may not hang with one end free.

(b) Cable and jumper connections between locomotive may not have any of the following conditions:

(1) Broken or badly chafed insulation.

(2) Broken plugs, receptacles or terminals.

(3) Broken or protruding strands of wire.

§ 229.91 Motors and generators.

A motor or a generator may not have any of the following conditions:

(a) Be shorted or grounded.

(b) Throw solder excessively.

(c) Show evidence of coming apart.

(d) Have an overheated support bearing.

(e) Have an excessive accumulation of oil.

Internal Combustion Equipment

§ 229.93 Safety cut-off device.

The fuel line shall have a safety cut-off device that—

(a) Is located adjacent to the fuel supply tank or in another safe location;

(b) Closes automatically when tripped and can be reset without hazard; and

(c) Can be hand operated from clearly marked locations, one inside the cab and one on each exterior side of the locomotive.

§ 229.95 Venting.

Fuel tank vent pipes may not discharge on the roof nor on or between the rails.

§ 229.97 Grounding fuel tanks.

Fuel tanks and related piping shall be electrically grounded.

§ 229.99 Safety hangers.

Drive shafts shall have safety hangers.

§ 229.101 Engines.

(a) The temperature and pressure alarms, controls and related switches of internal combustion engines shall function properly.

(b) Whenever an engine has been shut down due to mechanical or other problems, a distinctive warning notice giving reason for the shut-down shall be conspicuously attached near the engine starting control until repairs have been made.

(c) Wheel slip/slide protection shall be provided on a locomotive with an engine displaying a warning notice whenever required by § 229.115(b).

Steam Generators

§ 229.103 Safe working pressure; factor of safety.

The safe working pressure for each steam generator shall be fixed by the chief mechanical officer of the carrier. The minimum factor of safety shall be four. The fixed safe working pressure shall be indicated on FRA Form F 6180–49A.

§ 229.105 Steam generator number.

An identification number shall be marked on the steam generator's separator and that number entered on FRA Form F 6180–49A.

§ 229.107 Pressure gauge.

(a) Each steam generator shall have an illuminated steam gauge that correctly indicates the pressure. The steam pressure gauge shall be graduated to not less than one and one-half times the allowed working pressure of the stream generator.

(b) Each steam pressure gauge on a steam generator shall have a siphon that prevents steam from entering the gauge. The pipe connection shall directly enter the separator and shall be steam tight between the separator and the gauge.

§ 229.109 Safety valves.

Every steam generator shall be equipped with at least two safety valves that have a combined capacity to prevent an accumulation of pressure of more than five pounds per square inch above the allowed working pressure. The safety valves shall be independently connected to the separator and located as closely to the separator as possible without discharging inside of the generator compartment. The ends of the safety valve discharge lines shall be located or protected so that discharged steam does not create a hazard.

§ 229.111 Water-flow indicator.

(a) Steam generators shall be equipped with an illuminated visual return water-flow indicator.

(b) Steam generators shall be equipped with an operable test valve or other means of determining whether the steam generator is filled with water. The fill test valve may not discharge steam or hot water into the steam generator compartment.

§ 229.113 Warning notice.

Whenever any steam generator has been shut down because of defects, a distinctive warning notice giving reasons for the shut-down shall be conspicuously attached near the steam generator starting controls until the necessary repairs have been made. The locomotive in which the steam generator displaying a warning notice is located may continue in service until the next periodic inspection.

Cabs and Cab Equipment

§ 229.115 Slip/slide alarms.

(a) Except for MU locomotives, each locomotive used in road service shall be equipped with a device that provides an audible or visual alarm in the cab of either slipping or sliding wheels on powered axles under power. When two or more locomotives are coupled in multiple or remote control, the wheel slip/slide alarm of each locomotive shall be shown in the cab of the controlling locomotive.

(b) Except as provided in § 229.9, an equipped locomotive may not be dispatched in road service, or continue in road service following a daily inspection, unless the wheel slip/slide protective device of whatever type—

(1) Is functioning for each powered axle under power; and

(2) Would function on each powered axle if it were under power.

(c) Effective January 1, 1981, all new locomotives capable of being used in road service shall be equipped with a device that detects wheel slip/slide for each powered axle when it is under power. The device shall produce an audible or visual alarm in the cab.

§ 229.117 Speed indicators.

(a) After December 31, 1980, each locomotive used as a controlling locomotive at speeds in excess of 20 miles per hour shall be equipped with a speed indicator which is—

(1) Accurate within ±3 miles per hour of actual speed at speeds of 10 to 30 miles per hour and accurate within ±5 miles per hour at speeds above 30 miles per hour; and

(2) Clearly readable from the engineer's normal position under all light conditions.

(b) Each speed indicator required shall be tested as soon as possible after departure by means of speed test sections or equivalent procedures.

§ 229.119 Cabs, floors, and passageways.

(a) Cab seats shall be securely mounted and braced. Cab doors shall be equipped with a secure and operable latching device.

(b) Cab windows of the lead locomotive shall provide an undistorted view of the right-of-way for the crew from their normal position in the cab. (See also, Safety Glazing Standards, 49 CFR Part 223, 44 FR 77348, December 31, 1979.)

(c) Floors of cabs, passageways, and compartments shall be kept free from oil, water, waste or any obstruction that creates a slipping, tripping or fire hazard. Floors shall be properly treated to provide secure footing.

(d) The cab shall be provided with proper ventilation and with a heating arrangement that maintains a temperature of at least 50 degrees Fahrenheit 6 inches above the center of each seat in the cab.

(e) Similar locomotives with open end platforms coupled in multiple control and used in road service shall have a means of safe passage between them; no passageway is required through the nose of car body locomotives. There shall be a continuous barrier across the full width of the end of a locomotive or a continuous barrier between locomotives.

(f) Containers shall be provided for carrying fusees and torpedoes. A single container may be used if it has a partition to separate fusees from torpedoes. Torpedoes shall be kept in a closed metal container.

§ 229.121 Locomotive cab noise.

(a) After August 31, 1980, the permissible exposure to a continuous noise in a locomotive cab shall not exceed an eight-hour time-weighted average of 90dB(A), with a doubling rate of 5 dB(A) as indicated in the table. Continuous noise is any sound with a rise time of more than 35 milliseconds to peak intensity and a duration of more than 500 milliseconds to the time when the level is 20dB below the peak.

Duration permitted (hours):	Sound level (dB(A))
12	87
8	90
6	92
4	95
2	100
1½	102
1	105
½	110
¼ or less	115

(b)When the continuous noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect shall be considered. Exposure to different levels for various periods of time shall be computed according to the following formula:

$$D = T_1/L_1 + T_2/L_2 + \ldots T_n/L_n$$

Where:
D = noise dose.
T = the duration of exposure (in hours) at a given continuous noise level.
L = the limit (in hours) for the level present during the time T (from the table).
If the value of D exceeds 1, the exposure exceeds permissible levels.

(c) Exposure to continuous noise shall not exceed 115dB(A).

(d) Noise measurements shall be made under typical operating conditions using a sound level meter conforming, at a minimum, to the requirements of ANSI S1.4–1971, Type 2, and set to an A-weighted slow response or with an audiodosimeter of equivalent accuracy and precision.

(e) In conducting sound level measurements with a sound level meter, the microphone shall be oriented vertically and positioned approximately 15 centimeters from and on axis with the crew member's ear. Measurements with an audiodosimeter shall be conducted in accordance with manufacturer's procedures as to microphone placement and orientation.

§ 229.123 Pilots, snowplows, end plates.

After January 1, 1981, each lead locomotive shall be equipped with an end plate that extends across both rails, a pilot, or a snowplow. The minimum clearance above the rail of the pilot, snowplow or end plate shall be 3 inches, and the maximum clearance 6 inches.

§ 229.125 Headlights.

(a) Each lead locomotive used in road service shall have a headlight that produces at least 200,000 candela. If a locomotive or locomotive consist in road service is regularly required to run backward for any portion of its trip other than to pick up a detached portion of its train or to make terminal movements, it shall also have on its rear a headlight that produces at least 200,000 candela. Each headlight shall be arranged to illuminate a person at least 800 feet ahead and in front of the headlight.

(b) Each locomotive or locomotive consist used in yard service shall have two headlights, one located on the front of the locomotive or locomotive consist and one on its rear. Each headlight shall produce at least 60,000 candela and shall be arranged to illuminate a person at least 300 feet ahead and in front of the headlight.

(c) Headlights shall be provided with a device to dim the light.

§ 229.127 Cab lights.

(a) Each locomotive shall have cab lights which will provide sufficient illumination for the control instruments, meters, and gauges to enable the engine crew to make accurate readings from their normal positions in the cab. These lights shall be located, constructed, and maintained so that light shines only on those parts requiring illumination and does not interfere with the crew's vision of the track and signals. Each controlling locomotive shall also have a conveniently located light that can be readily turned on and off by the persons operating the locomotive and that provides sufficient illumination for them to read train orders and timetables.

(b) Cab passageways and compartments shall have adequate illumination.

§ 229.129 Audible warning device.

(a) After August 31, 1980, each lead locomotive shall be provided with an audible warning device that produces a minimum sound level of 96db(A) at 100 feet forward of the locomotive in its direction of travel. The device shall be arranged so that it can be conveniently operated from the engineer's normal position in the cab.

(b) Measurement of the sound level shall be made using a sound level meter conforming, at a minimum, to the requirements of ANSI S1.4–1971, Type 2, and set to an A-weighted slow response. While the locomotive is on level tangent track, the microphone shall be positioned 4 feet above the ground at the center line of the track, and shall be oriented with respect to the sound source in accordance with the manufacturer's recommendations.

(c) A 4dB(A) measurement tolerance is allowable for a given measurement.

§ 229.131 Sanders.

Except for MU locomotives, each locomotive shall be equipped with operable sanders that deposit sand on each rail in front of the first power operated wheel set in the direction of movement.

Subpart D—Design Requirements

§ 229.141 Body structure, MU locomotives.

(a) MU locomotives built new after April 1, 1956 that are operated in trains having a total empty weight of 600,000 pounds or more shall have a body structure designed to meet or exceed the following minimum specifications:

(1) The body structure shall resist a minimum static end load of 800,000 pounds at the rear draft stops ahead of the bolster on the center line of draft, without developing any permanent deformation in any member of the body structure.

(2) An anti-climbing arrangement shall be applied at each end that is designed so that coupled MU locomotives under full compression shall mate in a manner that will resist one locomotive from climbing the other. This arrangement shall resist a vertical load of 100,000 pounds without exceeding the yield point of its various parts or its attachments to the body structure.

(3) The coupler carrier and its connections to the body structure shall be designed to resist a vertical downward thrust from the coupler shank of 100,000 pounds for any horizontal position of the coupler, without exceeding the yield points of the materials used. When yielding type of coupler carrier is used, an auxiliary arrangement shall be provided that complies with these requirements.

(4) The outside end of each locomotive shall be provided with two main vertical members, one at each side of the diaphragm opening; each main member shall have an ultimate shear value of not less than 300,000 pounds at a point even with the top of the underframe member to which it is attached. The attachment of these members at bottom shall be sufficient to develop their full shear value. If reinforcement is used to provide the shear value, the reinforcement shall have full value for a distance of 18 inches up from the underframe connection and then taper to a point approximately 30 inches above the underframe connection.

(5) The strength of the means of locking the truck to the body shall be at least the equivalent of an ultimate shear value of 250,000 pounds.

(b) MU locomotives built new after April 1, 1956 that are operated in trains having a total empty weight of less than 600,000 pounds shall have a body structure designed to meet or exceed the following minimum specifications:

(1) The body structure shall resist a minimum static end load of 400,000 pounds at the rear draft stops ahead of the bolster on the center line of draft, without developing any permanent deformation in any member of the body structure.

(2) An anti-climbing arrangement shall be applied at each end that is designed so that coupled locomotives under full compression shall mate in a manner that will resist one locomotive from climbing the other. This arrangement shall resist a vertical load of 75,000 pounds without exceeding the yield point of its various parts or its attachments to the body structure.

(3) The coupler carrier and its connections to the body structure shall be designed to resist a vertical downward thrust from the coupled shank of 75,000 pounds for any horizontal position of the coupler, without exceeding the yield points of the materials used. When a yielding type of coupler carrier is used, an auxiliary arrangement shall be provided that complies with these requirements.

(4) The outside end of each MU locomotive shall be provided with two main vertical members, one at each side of the diaphragm opening; each main member shall have an ultimate shear value of not less than 200,000 pounds at a point even with the top of the underframe member to which it is attached. The attachment of these members at bottom shall be sufficient to develop their full shear value, the reinforcement shall have full value for a distance of 18 inches up from the underframe connection and then taper to a point approximately 30 inches above the underframe connection.

(5) The strength of the means of locking the truck to the body shall be at least the equivalent of an ultimate shear value of 250,000 pounds.

Note.—Appendix A will not appear in Title 49 of the CFR. Copies of Form FRA F6180–49A are available by contacting the Federal Railroad Administration, Office of Standards and Procedures, 400 7th St., SW., Washington, D.C. 20590.

BILLING CODE 4910-06-M

APPENDIX A - Form FRA F6180-49A (FRONT)

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

LOCOMOTIVE INSPECTION AND REPAIR RECORD

In accordance with the Locomotive Inspection Act 36 State 913, as amended and the regulations issued pursuant to that Act, the parts and appurtenances of the locomotive unit have been inspected and all defects disclosed by the inspection have been properly repaired

Reporting year 19____ Check if new loco. ☐ If loco. renumbered give previous no. | | | | | | |

1. OPERATED BY	RR CODE	2. OWNED BY (Railroad)	RR CODE

3. MODEL NO.	4. LOCO. NO.	5. YR. BUILT	6. PROPELLED BY	7. HORSEPOWER	8. TYPE OF SERVICE. PASSENGER ☐ ROAD ☐ YARD ☐ OTHER ☐

9. STEAM GEN.	GEN. #1. Working Pressure	GEN. #2. Working Pressure

10. MAXIMUM PISTON TRAVEL inches	11. OUT OF USE CREDIT

12 LAST PERIODIC INSPECTION DATE	PLACE

PERIODIC INSPECTIONS

13. DATE MO DAY YR	14. PLACE	15.* ITEMS	16. PERSON CONDUCTING	15.* ITEMS	16. PERSON CONDUCTING	17. CERTIFIED BY

15.* ITEM CODE: [1] BRAKES [2] RUNNING GEAR [3] CAB EQUIP. [4] MECH. EQUIP. [5] ELECT. EQUIP. [6] STEAM GEN. [7] SAFETY APPL.

TESTS	18. H&H TEST PRESSURE	19. WAIVER PART-229	20. WAIVER-OTHER

TYPE	INTERVAL NOT MORE THAN	21. PERSON CONDUCTING	22. TEST DATE AND PLACE	23. CERTIFIED BY	24. PREVIOUS TEST DATE AND PLACE
METER	368 calendar days				
HAMMER AND HYDRO	736 calendar days				
AIRBRAKE 229.27	368 calendar days				
AIRBRAKE 229.29	736 calendar days				

Certification of true copy.
I certify that this is a true copy of the inspection and repair record of locomotive no. _____

_____
(Officer-in-charge) DATE

ATTENTION: *A false entry on this form is punishable by fine or imprisonment (U.S. Code, Title 18, Sec. 1001).*

FORM FRA F6180-49 A

OMB Approval No. 004-R-4011

GOVERNMENT PROPERTY DO NOT REMOVE

(BACK)

INSTRUCTIONS

1. OPERATED BY: Enter the name and code* of the railroad primarily responsible for operating the locomotive at the time the report is placed in the locomotive. Operator changes, including dates, shall be noted in "Remarks."
2. OWNER: Enter the name and code* of the owner. Changes in ownership shall be submitted as final reports.
3. MODEL NO.: Enter the original builder's model number.
4. LOCOMOTIVE NO.: Enter only the locomotive number. Include letters only if they are part of the locomotive markings. If the locomotive number is changed, include the information at the top of the form.
5. YEAR BUILT: Enter the year the locomotive was built or rebuilt.
6. PROPELLED BY: Enter Diesel-Electric (D-E), Electric (E). Mu. Mu Control Cab (MUC), Non-Mu Control Cab (NMUC), Turbo (T), Torque Converter (TC), Other (O).
7. HORSEPOWER: Enter horsepower rating.
8. TYPE OF SERVICE: Enter type of service the locomotive is assigned to when the report is placed in the locomotive.
9. Enter steam generator number(s) and safe working pressure(s).
10. Enter maximum piston travel. Enter only "Nominal" travel and do not include Manufactures Tolerance.
11. Enter number of creditable calendar days the locomotive was out-of-use. Less than 30 consecutive calendar days for any out-of-use period may not be counted. Any entry "out-of-use from _____ to _____" shall be made on an inspection line and certified when a locomotive is not in use when an inspection would otherwise be due. If the locomotive is out-of-use at the end of the reporting period, complete the "To" entry with the last day of the period. The entry on the replacement report should then record the "From" as the beginning of the new period.
12. LAST PERIODIC INSPECTION AND TESTS: This report covers annual periods (January 1 to December 31). The report of the preceding annual period shall be retained in the locomotive until the first periodic inspection is made after January 1 of each year or until the form is replaced as required by Section 229.23(e). When a new form 6180.49A is placed in the locomotive, enter the last periodic inspection information onto the new form in item 12 and the test information in item 24. Tests that are not applicable should be noted "NA".
    INSPECTIONS AND TESTS: Persons making the required tests and periodic inspections shall sign for the items tested or inspected. The employee's supervisor shall certify that the tests and inspections were completed.
    TESTS: Where the carrier has chosen to fragment air brake cleaning, repairing and testing required by Sections 229.27 & 29. an air record shall be maintained in the cab of the locomotive.
18. H&H: Enter test pressure from the hydrostatic test. If reservoirs are drilled: enter work "Drilled".
    CODE*: Carriers shall enter only the code assigned by FRA to their railroad.
19. Any waivers of any type from a requirement of 49CFR Part 229 shall be identified in block No. 19 by its waiver number or by the section number affected. Explanatory information regarding the scope and content of the waiver shall be included under "Remarks".
20. Any waiver from any FRA requirement other than a requirement of 49CFR Part 229 shall be identified in block No. 20 by its waiver number or by the part and section number affected. Explanatory information regarding the scope and content of the waiver shall be included under "Remarks".
    REPAIRS: Defects not properly repaired.

NOISE: Enter any noise tests or related information in accordance with 49 CFR 210.31.

REMARKS: The carriers should enter under "Remarks" any other clarifying or explanatory information.

State of _____ County of _____ on this day of _____

_____ personally appeared before me and signed this report as officer-in-charge, who disposes and says that this is a true copy of the inspection and repair record of the locomotive unit identified.

Subscribed and sworn to before me according to law this _____ day of _____.

My commission expires _____

_____

NOTARY PUBLIC

BILLING CODE 4910-06-C

Appendix B—*Schedule of Civil Penalties*[1]

	Violation	Intentional[2] violation
Subpart A—General		
§ 229.7 Prohibited acts. Safety deficiencies not governed by specific regulation: To be assessed on relevant facts	$250–2,500	$250–2,500
§ 229.9 Movement of non-complying locomotives	([3])	([3])
§ 229.11 Locomotive identification	250	500
§ 229.13 Control of locomotives	1,000	1,500
§ 229.15 Final report	250	500
§ 229.17 Accident reports	1,000	1,500
§ 229.18 Prior waivers	([4])	([4])
Subpart B—Inspections and Tests		
§ 229.21 Daily inspection		
(a)(b)		
(i) Inspection overdue	$500	$1,000
(ii) Inspection report not made, improperly executed, or not retained	250	500
(c) Inspection not performed by a qualified person	500	750
§ 229.23 Periodic inspection: General		
(a)(b)		
(i) Inspection overdue	1,000	2,000
(ii) Inspection performed improperly or at a location where the underneath portion cannot be safely inspected	750	1,500
(c)(d)		
(i) Form missing	500	1,000
(ii) Form not properly displayed	250	500
(iii) Form improperly executed	500	1,000
(e)(f)	250	500
§ 229.25 Tests: Every periodic inspection	1,000	2,000
§ 229.27 Annual tests	1,000	2,000
§ 229.29 Biennial tests	1,000	2,000
§ 229.31 Main reservoir tests		
(a)(b)	750	1,250
(c)(d)	1,000	1,500
§ 229.33 Out-of-use credit	250	500
Subpart C—Safety Requirements		
§ 229.41 Protection against personal injury	$500	$750
§ 229.43 Exhaust and battery gases	750	1,000
§ 229.45 General condition: To be assessed based on relevant facts	250–2,500	250–2,500
§ 229.46 Brakes: General	1,000	1,500
§ 229.47 Emergency brake valve	500	750
§ 229.49 Main reservoir system		
(a)	750	1,250
(b)(c)	500	1,000
§ 229.51 Aluminum main reservoirs	500	1,000
§ 229.53 Brake gauges	500	750
§ 229.55 Piston travel	500	750
§ 229.57 Foundation brake gear	750	1,250
§ 229.59 Leakage	500	750
§ 229.61 Draft system	1,000	1,500
§ 229.63 Lateral motion	500	750
§ 229.64 Plain bearings	750	1,250
§ 229.65 Spring rigging	750	1,250
§ 229.67 Trucks	500	1,000
§ 229.69 Side bearings	750	1,250
§ 229.71 Clearance above top of rail	1,000	1,500
§ 229.73 Wheel sets	500	1,000
§ 229.75 Wheel and tire defects		
(a)(d) Slid flat or shelled spot(s):		
(i) One spot 2½" or more but less than 3" in length	750	1,000
(ii) One spot 3" or more in length.	1,500	2,000
(iii) Two adjoining spots each of which is more than 2" but less than 2½" in length	1,000	1,500
(iv) Two adjoining spots each of which are at least 2" in length, if either spot is 2½" or more in length	1,500	2,000
(b) Gouge or chip in flange of:		
(i) More than 1⅛" but less than 1⅝" in length; and more than ½" but less than ⅝" in width	1,000	1,500
(ii) 1⅝" or more in length and ⅝" or more in width	1,500	2,000
(c) Broken rim	1,000	1,500
(e) Seam in tread	500	1,000
(f) Flange thickness of:		
(i) ⅞" or less but more than $1\frac{3}{16}$"	1,500	2,000
(ii) $1\frac{3}{16}$" or less	2,000	2,500
(g) Tread worn hollow	750	1,000
(h) Flange height of:		
(i) 1½" or greater but less than 1⅝"	1,500	2,000
(ii) 1⅝" or more	2,000	2,500
(i)Tire thickness	750	1,250
(j) Rim thickness:		
(i) Less than 1" in road service and ¾" in yard service	1,500	2,000
(ii) $1\frac{15}{16}$" or less in road service and $1\frac{1}{16}$" in yard service	2,000	2,500
(k) Cracked or broken:		
(i) Crack of less than 1"	1,250	1,750
(ii) Crack of 1" or more	2,000	2,500
(iii) Break	2,500	2,500
(l) Loose wheel or tire	1,500	2,000
(m) Welded wheel or tire	2,000	2,500
§ 229.77 Current collectors	500	1,000
§ 229.79 Third rail shoes and beams	500	1,000
§ 229.81 Emergency pole; shoe insulation	500	1,000
§ 229.83 Insulation or grounding of metal parts	1,000	1,500
§ 229.85 Door and cover plates marked "Danger"	500	750
§ 229.87 Hand operated switches	500	750
§ 229.89 Jumpers; cable connections		
(a)	500	750
(b)	1,000	1,500
§ 229.91 Motors and generators	1,000	1,500
§ 229.93 Safety cut-off device	500	750
§ 229.95 Venting	500	750
§ 229.97 Grounding fuel tanks	500	750
§ 229.99 Safety hangers	500	750
§ 229.101 Engines		
(a)	1,000	1,500
(b)	500	750
(c)	1,000	1,500
§ 229.103 Safe working pressure; factor of safety	500	750
§ 229.105 Steam generator number	250	500
§ 229.107 Pressure gauge	500	1,000
§ 229.109 Safety valves	1,000	1,500
§ 229.111 Water-flow indicator	500	750
§ 229.113 Warning notice	500	750
§ 229.115 Slip/slide alarms	1,000	1,500
§ 229.117 Speed indicators	750	1,000
§ 229.119 Cabs, floors, and passageways		
(a)		
(i) Cab seat not securely mounted or braced	1,000	1,500
(ii) Insecure or inoperative latching device	500	1,000
(b)(c)(d)(e)(f)	500	750
§ 229.121 Locomotive cab noise	500	750
§ 229.123 Pilots, snowplows, end plates	500	1,000
§ 229.125 Headlights	1,000	1,500
§ 229.127 Cab lights	750	1,250
§ 229.129 Audible warning device	500	750
§ 229.131 Sanders	500	1,000
Subpart D—Design Requirements		
§ 229.141 Body structure, MU locomotives	500	1,000

[1] 45 U.S.C. 34 requires the Secretary of Transportation to assess a penalty of not less than $250 nor more than $2,500 for each and every violation of the Locomotive Inspection Act or any rule or regulation promulgated under that statute.

[2] For purposes of this schedule, an intentional violation is the knowing and willful failure of a carrier to comply with the provisions of this part. The knowledge required for an intentional violation is knowledge of the facts constituting the violation. Knowledge of the regulations is presumed by law. Evidence that a violation has been committed or has been allowed to continue after an FRA inspector has provided the carrier notification of non-compliance with this part is *prima facie* evidence that the violation was knowing and willful. Evidence that a repair has been made to a locomotive part or appurtenance but that such part or appurtenance was not brought into full compliance with this part is *prima facie* evidence that the violation was knowing and willful.

[3] Failure to observe any condition for movement set forth in paragraph (a) of § 229.9 will deprive the carrier of the exception and make the carrier liable for penalty under §§ 229.7 through 229.141.

[4] Failure to comply with this provision will result in the lapse of any affected waiver.

Appendix C—FRA Locomotive Standards

Code of Defects

The following defect code has been established for use by FRA's Motive Power & Equipment inspectors to report defects observed during inspection of locomotives. The purpose of the code is to establish a uniform language among FRA and the railroad industry that will facilitate communication, recordkeeping, and statistical analyses. The code may not be substituted for the description of defects on bad order cards affixed to locomotives being moved for repairs under 229.9. However, it may be used to supplement that description.

Description of Defects

229.007 Prohibited Acts

(a)(1) Locomotive not in proper condition and safe to operate.

229.009 Movement for Non-complying Locomotives

Failure to meet conditions for movement of non-complying locomotives for repairs.

229.011 Locomotive Identification

(a) Letter "F" missing;

(b) Locomotive number missing.

229.013 Control of Locomotives

229.015 Final Report

(a) Locomotive;

(b) Steam generator.

229.017 Accident Report

(a)(1) Failure to report accident;

(2) Failure to preserve defective locomotive or part(s);

(b) Written confirmation.

229.019 Prior Waivers

229.021 Daily Inspection

(a)(1) Locomotive overdue for inspection;

(2) Failure to make written report of inspection;

(3) Inspection report not properly made out;

(4) Defects not reported;

(5) Defects not repaired;

(6) Report not retained for one year.

(b) MU Daily Inspection.

(1) Locomotive overdue inspection;

(2) Failure to make written report of inspection;

(3) Inspection report not properly made out;

(4) Defects not reported;

(5) Defects not repaired; and

(6) Report not retained for one year.

(c) Failure to use qualified person.

229.023 Periodic Inspection General

(a)(1) Periodic inspection not made to locomotive within 92 days;

(2) Periodic inspection not made to steam generator within 92 days;

(3) Locomotive not positioned so entire underneath portion can be safely inspected; and

(4) Inspection made with no facilities available.

(b) Steam generator not properly rendered inoperative.

(d)(1) Form 6180–49A missing;
(2) Form 6180–49A improperly made out;
(3) Form 6180–49A not under transparent cover;
(4) Transparent cover missing or broken.
(e) Form 6180–49A not filed by May 1 each year with the Federal Railroad Administration (FRA).
(f)(1) Secondary Form 6180–49A missing;
(2) Secondary Form 6180–49A not retained for two years.

229.025 Tests: Every Periodic Inspection
(a) Gauges not inspected.
(b)(1) Electrical inspection not made;
(2) Electric devices defective;
(3) Electric insulation defective.
(c) 600 volt cable connection or jumper cables not inspected;
(d)(1) Steam generators automatic controls, alarms and protective devices not inspected or tested or defective;
(2) Steam pressure gauge not tested.
(3) Safety valves not properly set and tested.

229.027 Annual Tests
(a)(1) Failure to clean, repair or replace main air reservoir filtering devices or dirt collectors;
(2) Failure to clean, repair or replace:
(A) Brake cylinder relay valve portions;
(B) Main air reservoir safety valves;
(C) Brake pipe vent valve portions;
(D) Feed and reducing valve portion;
(E) Related dirt collectors and filters.
(F) All of the above.
(3) Failure to properly record air brake inspection information on Form 6180–49A.
(4)(A) Failure to properly record air brake inspection information on air record;
(B) Transparent record holder broken or missing;
(C) Duplicate air record missing or improperly made out.
(b)(1) Load meters not tested;
(2) Load meter in error;
(3) Test data not on Form 6180–49A.
(c)(1) Hydrostatic test of steam generator not made properly;
(2) Visual return water-flow indicator not removed, inspected or defective.

229.029 Biennial Tests
(a)(1) Air brake valves and valve portions, including related dirt collectors and filters not cleaned, repaired or tested.
(2) Failure to properly record air brake inspection information on:
(A) FRA Form 6180–49A;
(B) Carrier's maintenance files;
(C) Not under transparent cover in locomotive cab.

229.031 Main Reservoir Tests
(a)(1) Hydrostatic test not made;
(2) Hydrostatic test improper;
(3) Hydrostatic Test not properly recorded on FRA Form 6180–49A.
(b)(1) Hammer test not made;
(2) Hammer test improper;
(3) Hammer test not properly recorded on FRA Form 6180–49A.
(c)(1) Main reservoir not drilled;
(2) Main reservoir improperly drilled;
(3) Telltale hole penetrated.
(d) Aluminum main reservoir defective.

229.033 Out-of-Use Credit
(a) Out-of-use credit not valid;
(b) Out-of-use credit improperly recorded.

229.041 Protection Against Personal Injury—Protection not provided or defective:
(a) Fan openings;
(b) Exposed gears and pinions;
(c) Exposed moving parts of mechanisms;
(d) High-voltage equipment;
(e) Switches, circuit breakers, contactors, relays grid resistors and fuses.

229.043 Exhaust and Battery Gases
(a)(1) Exhaust stacks improper height;
(2) Exhaust manifold defective;
(3) Exhaust gases into cab or other compartments.
(b) Batteries defective.

229.045 General Condition
(a) Locomotive systems and components defective or insecure:
(1) Third rail shoes or beams;
(2) Traction motors and motor gear cases;
(3) Fuel tanks;
(4) Other.
(b) Hazardous leaks:
(1) Fuel;
(2) Oil;
(3) Water;
(4) Steam;
(5) Other.
(c) Excessive accumulation of oil on electrical equipment.
(d) Improper functioning of components:
(1) Slack adjusters;
(2) Pantograph operating cylinders;
(3) Circuit breakers;
(4) Contactors;
(5) Relays;
(6) Switches;
(7) Fuses;
(8) Other.
(e) Cracks, breaks, excessive wear and other structural infirmities of components:
(1) Quill drives;
(2) Axles;
(3) Gears;
(4) Pinions;
(5) Pantograph shoes and horns;
(6) Third rail beams;
(7) Traction motor gear cases;
(8) Fuel oil tanks;
(9) Other.

229.046 Brakes
(a) Brake inoperative;
(b) Automatic brake valve defective;
(c) Independent brake valve defective;
(d) Devices for regulating pressure defective;
(e) Water and oil not drained from air brake system;
(f) Other.

229.047 Emergency Brake Valve
(a) or (b) Emergency brake valve:
(1) Missing;
(2) Defective;
(3) Improperly positioned;
(4) Improperly stenciled or marked.

229.049 Main Reservoir System
(a) (1) Main reservoir safety valve:
(A) Missing;
(B) Defective.
(a) (2) Control air:
(A) Missing;
(B) Defective;
(C) Improperly applied.
(b) Air compressor governor:
(1) Inoperative;
(2) Defective;
(3) Other.

229.051 (a) Aluminum main reservoirs:
(1) Improperly designed;
(2) Defective.

229.053 Brake Gauges—Gauges:
(a) Improperly located;
(b) Inoperative;
(c) Defective;
(d) Other.

229.055 Piston Travel
(a) Brake cylinder piston travel is defective if:
(1) Brake shoe will not clear wheel when released;
(2) Piston travel excessive;
(3) Brake cylinder pressure improper.

229.057 Foundation Brake Gear—Foundation brake gear is defective if:
(a) Cracked;
(b) Broken;
(c) Missing;
(d) Worn more than 30 percent;
(e) Insecure;
(f) Improperly applied;
(g) Other.

229.059 Leakage—Excessive leakage in air brake system:
(a) Main air reservoir and related piping;
(b) Brake pipe;
(c) Brake cylinders;
(d) Control air reservoir;
(e) Other.

229.061 Draft System
(a) Defective coupler:
(1) (A) Gauge exceeds 5⅛" on standard couplers;
(B) Gauge exceeds 5$^{9}/_{16}$" on D and E couplers;
(2) (A) Cracked;
(B) Broken;
(3) Anti-creep;
(4) Slack;
(5) Broken or cracked coupler carrier;
(6) Broken or cracked yoke;
(7) Broken draft gear;
(8)(A) Device under draw gear pin missing or broken;
(B) Device under articulated-connection pin missing or broken.

229.063 Lateral Motion
(a) Excessive lateral:
(1) Non-powered axles (1");
(2) Powered axles (¾");
(3) MU locomotives (1");
(4) Friction bearing axles (1").
(b) Center axle (1¼");

229.064 Plain Bearings
(a) No oil;
(b) Cracked box;
(c) Other.

229.065 Spring Rigging
(a) Safety Hangers;
(1) Loose;
(2) Cracked;
(3) Broken;
(4) Missing.
(b)(1) Elliptical spring:
(A) Broken;
(B) Missing;
(b)(2) Coil spring is:
(A) Broken;
(B) Missing;
(C) Compressed fully.
(b)(3) Cracked or broken equalizer, hanger bolt, gib or pin.
(c) Shock absorber is:
(1) Broken;

(2) Loose;
(3) Leaking;
(4) Inoperative.

229.067 Trucks
(a) Center plate lost motion;
(b) Securement;
(c)(1) Loose;
(2) Cracked;
(3) Broken;
(4) Missing.

229.069 Side Bearings
(a) Broken springs;
(b) Side bearings in contact;
(1) Side bearings clearance excessive;
(2) Otherwise defective.

229.071 Clearance Above Top of Rail Less Than 2½ Inches

229.073 Wheel Sets
(a) Wheel circumference improper;
(b)(1) Wheel diameter over ¾";
(2) Wheel diameter over 1¼";
(3) Otherwise defective.
(c) Gauge improper.
(d) Gauge between flanges.

229.075 Wheel and Tire Defects
(a) or (d) Wheel has slid flat spot or shelled spot:
(1) 2½" in length or more;
(2) Has two adjoining spots each of which is 2" in length or greater;
(3) A single spot 3" in length or more;
(4) Has two adjoining spots one of which is at least 2" in length and the other is 2½" or greater.
(b) Chip or gouge in flange:
(1) 1½" length and ½" in width or more;
(2) 1⅜" length and ⅝" in width or more;
(3) 1¾" in length and ¾" in width or more.
(c) Broken Rim:
(1) Tread less than 3¾";
(2) Tread less than 3½".
(e) Seam in tread.
(f) Worn flange
(1) Flange ⅞" or less at ⅜" above the tread;
(2) Flange 1 3/16" or less at ⅜" above the tread;
(3) Flange ¾" or less at ⅜" above the tread.
(g) Tread worn hollow:
(1) Road locomotive;
(2) Switching locomotive.
(h) Flange height
(1) Flange is 1½" or more from the tread to top of flange;
(2) Flange is 1⅝" or more from the tread to top of flange;
(3) Flange is 1¾" or more.
(i) Tire less than 1½" thick.
(j) Rim Thickness:
(1) Less than 1" in road service;
(2) Less than 1 5/16" in road service;
(3) Less than ¾" in road service;
(4) Less than ¾" in yard service;
(5) Less than 1 1/16" in yard service;
(6) Less than ⅝" in yard service.
(k) Crack or break in:
(1) Flange;
(2) Tread;
(3) Rim;
(4) Plate;
(5) Hub area.
(l) Loose wheel or tire.
(m) Welded wheel or tire.
(1) A welded wheel or tire on locomotive that is not moving for repairs;
(2) Improperly welding of wheel or tire.

229.077 Current Collectors
(a)(1) Pantograph not operating properly from engineer's position;
(2) Pantograph not locked in down position automatically.
(b)(1) Pantograph not grounded or properly locked;
(2) Pantograph not operating where operator can see operation.

229.079 Third Rail Shoes and Beams
(a) Third rail shoes not properly deenergized;
(b) Overhead collectors not properly deenergized.

229.081 Emergency Pole; Shoe Insulation
(a)(1) Emergency pole missing or defective;
(2) Emergency pole not properly marked;
(3) Emergency pole not protected from moisture.
(b) Third-rail shoe insulating device missing or defective.

229.083 Insulation or grounding of metal parts—Unguarded noncurrent-carrying metal parts not properly gounded or insulated.

229.085 Door and cover plates marked "Danger."—High-voltage equipment not properly marked.

229.087 Hand-Operated Switches
(a) Hand operated switches not properly covered;
(b) Hand operated switches not properly designated;
(c) Hand operated switches not properly marked.

229.089 Jumper; Cable Connections
(a) Jumpers and cables not properly located or guarded;
(b) Defective cable and jumpers between locomotives:
(1) Broken or badly chafed insulation;
(2) Broken plugs, receptacles or terminals;
(3) Broken or protruding strands of wire.

229.091 Motor and Generators—Motors or generators are defective if:
(a) Shorted or grounded;
(b) Throw solder excessively;
(c) Show evidence of coming apart;
(d) Overheated support bearing;
(e) Have an excessive accumulation of oil.

229.093 Safety Cut-Off Device—Fuel line safety cut-off device is defective if:
(a) Not properly located.
(b)(1) Does not close automatically;
(2) Cannot be reset without hazard.
(c)(1) Not properly marked:
(2) Inoperative.

229.095 Venting—Fuel tank vent pipes not properly venting.

229.097 Grounding Fuel Tanks—Fuel tank not properly grounded.

229.099 Safety Hanger—Drive shaft safety hanger is defective if:
(a) Missing;
(b) Loose;
(c) Defective.

229.101 Engines—Internal combustion engines are defective if:
(a) Temperature, pressure alarms, controls and related switches are:
(1) Inoperative;
(2) Defective;
(3) Missing.
(b) Warning notice missing or improperly made out.
(c) Wheel slip/slide improper when required.

229.103 Safe Working Pressure; Factor of Safety:
(a) Minimum factor of safety improper;
(b) Safe working pressure not properly designated.

229.105 Steam Generator Number
(a) Identification number not properly marked on:
(1) Separator;
(2) Form 6180–49A.

229.107 Pressure Gauge
(a) Steam pressure gauge is defective if:
(1) Not properly illuminated;
(2) Missing;
(3) Improper;
(4) Defective.
(b)(1) Steam gauge siphon improper;
(2) Pipe connection improperly applied;
(3) Siphon leaking or defective.

229.109 Safety Valves—Steam generator safety valves are defective if:
(a) Missing;
(b) Improperly set;
(c) Improperly located;
(d) Discharging inside compartment;
(e) Discharging lines not properly located or protected.

229.111 Water-Flow Indicator:
(a)(1) Visual water-flow indicator not properly illuminated,
(2) Defective.
(b)(1) Test valve missing;
(2) Inoperative;
(3) Defective.

229.113 Warning Notice:
(a) Warning notice missing, or
(b) Improperly made out;
(c) Improperly located.

229.115 Slip/Slide Alarms:
(a) or (b) Wheel slip/slide device or alarm is defective if:
(1) Non-equipped;
(2) Inoperative;
(3) Improper.

229.117 Speed Indicators:
(a) Speed indicators are defective if:
(1) Not equipped;
(2) Inoperative or otherwise defective;
(3) Not readable.
(b) Testing.

229.119 Cabs, Floors and Passageways—Cabs, floors and passageways are defective if:
(a)(i) Cab seat missing or defective.
(ii) Door latch missing or defective.
(b) Cab windows defective.
(c) Hazardous floors, passageways and compartments.
(d)(1) Cab ventilation improper;
(2) Cab temperature improper.
(e) Continuous barrier missing or improper.
(f) Fuses and torpedo container missing or improper.

229.121 Locomotive Cab Noise
(a) Cab noise is excessive if it exceeds:
(1) 87 db;
(2) 90 db;
(3) 92 db;
(4) Over 92 db;
(5) Over 115 db.

229.123 Pilot, Snowplows and End Plates—A locomotive is defective if not equipped with an:
(a) Pilot;

(b) Snowplow;
(c) End plate;
(d) Too high or low;
(e) Insecure.

229.125 Headlight

(a) A headlight on a road locomotive is defective if:
(1) Inoperative;
(2) Missing;
(3) Inadequate.
(b) A headlight on a yard locomotive is defective if:
(1) Inoperative;
(2) Missing;
(3) Inadequate.
(c) Device to dim headlight.

229.127 Cab Lights

(a) Cab lights are defective if:
(1) Inoperative;
(2) Missing;
(3) Inadequate;
(4) Improperly positioned;
(5) Defective.
(b) Cab passageways and compartments lights are defective if:
(1) Inoperative;
(2) Missing;
(3) Inadequate.

229.129 Audible Warning Device

(a) The audible warning device is defective if:
(1) Missing;
(2) Inoperative;
(3) Inadequate.

229.131 Sanders—Sanders are defective if:
(a) Missing;
(b) Inoperative;
(c) Not lined to rail;
(d) Creating a personal injury hazard;
(e) Insecure.

229.141 (a) The body structure of a locomotive (MU) built after April 1, 1956, operating in trains of more than 600,000 pounds, is defective if—
(1) Cannot resist a static end load force of 800,000 pounds;
(2) Anti-climber cannot resist a vertical load of 100,000 pounds;
(3) Coupler carrier cannot resist a vertical downward thrust of 100,000 pounds;
(4) Diaphram members do not have an ultimate shear value of 300,000 pounds;
(5) Locking truck to car body cannot resist an ultimate shear force of 250,000 pounds;
(b) The body structure of a locomotive (MU) built after April 1, 1956, operating in a train of less than 600,000 pounds, is defective if—
(1) Cannot resist a static end load force of 400,000 pounds;
(2) Anti-climber cannot resist a vertical load of 75,000 pounds;
(3) Coupler carrier cannot resist a vertical downward thrust of 75,000 pounds;
(4) Diaphram members do not have an ultimate shear value of 200,000 pounds;
(5) Locking truck to car body cannot resist an ultimate shear force of 250,000 pounds.

(Secs. 1, 2, 5, 9, 36 Stat. 913, 914 (45 U.S.C. 22, 23, 28, 34); sec. 6(e) and (f), 80 Stat. 939, 940 (49 U.S.C. 1655(e) and (f).)

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John M. Sullivan,
Administrator.

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